Vol. XIX. Part 2.

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The Journal of the Department of Agriculture of Victoria, Australia.

February, 1921.

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Crop and Fallow Competitions

New Zealand Flax

Home Wine Making

The Rearing of Calves

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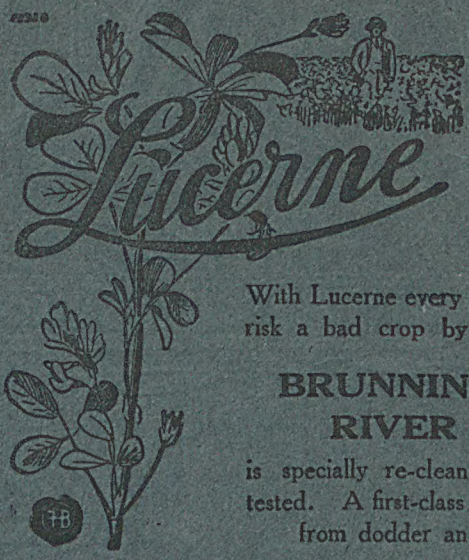

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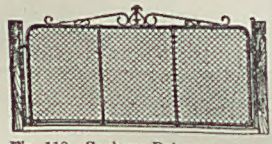

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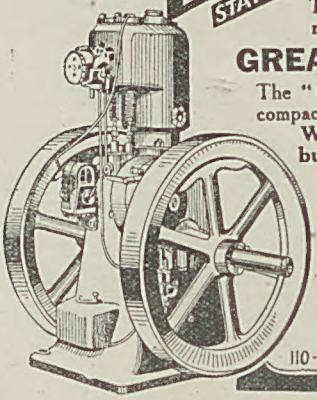

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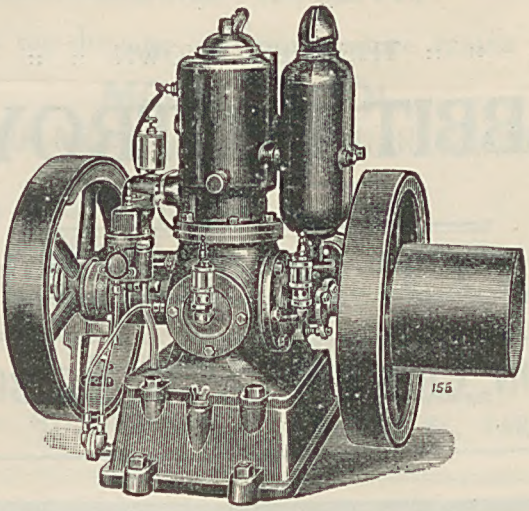

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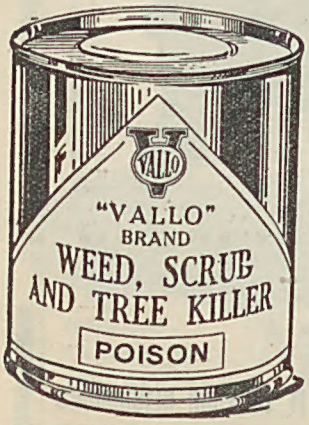

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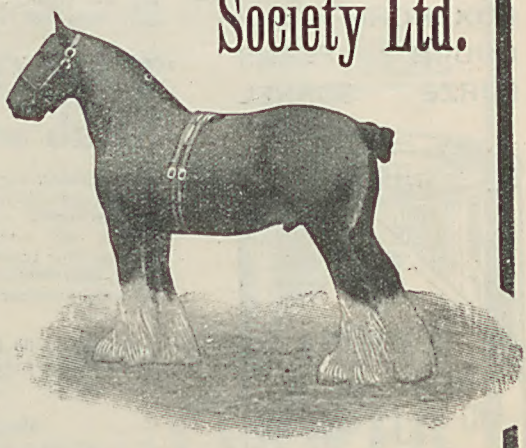

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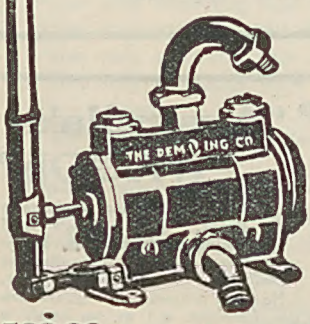

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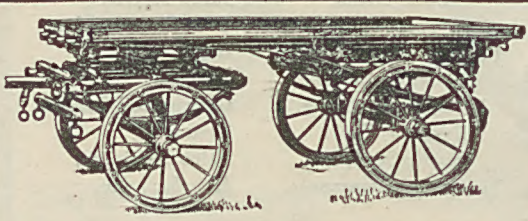

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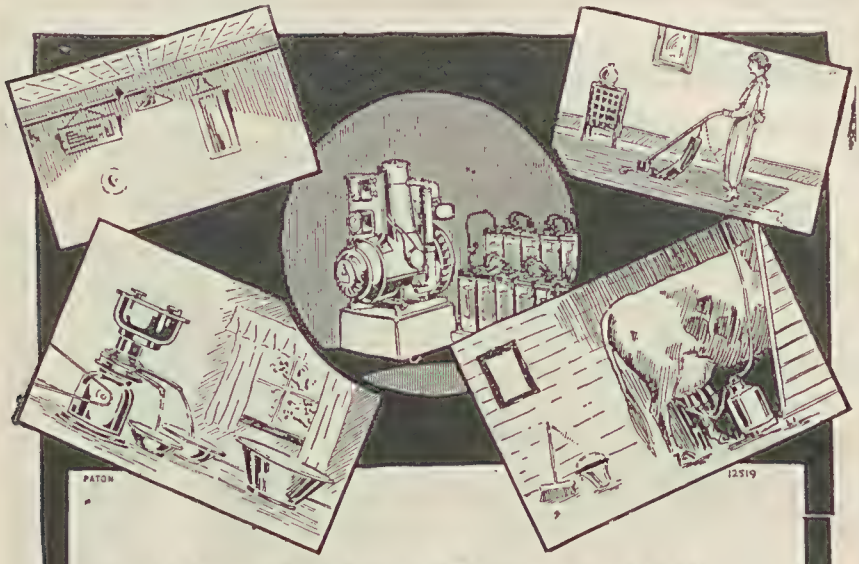

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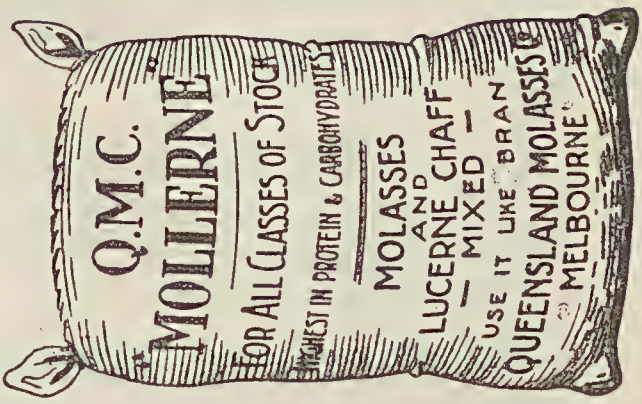

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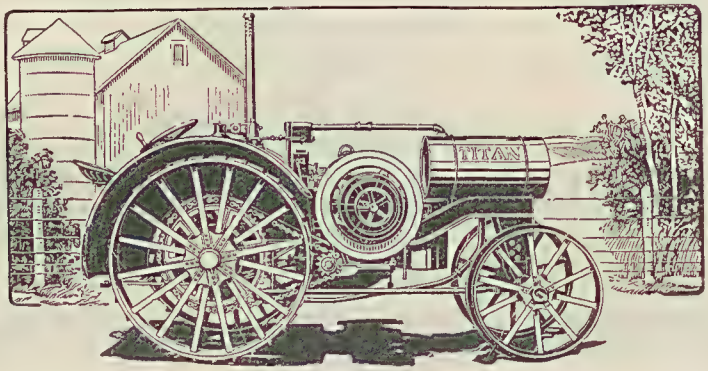

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CROP AND FALLOW COMPETITION.

Report on the Warracknabeal Crop and Fallow Competition by the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

Herewith I submit my report as judge of the recent Crop and Fallow Competition conducted by your Society.

Your Society is to be commended for its enterprise in extending its activities to this educational movement, which has for its object the improvement of farming methods, and hence increased profits from the farm. Competitions of this sort have commonly been regarded in the past as mere contests for prizes, but the experience of the Nhill Agricultural Society, which is the pioneer in the movement, has shown that the scope of the Crop and Fallow Competition may be so broadened as to become a public investigation into the methods by which the best crops are grown each year. In this way information which is of the greatest value to the local wheat-grower is discovered.

It cannot be too strongly urged that the members of your Society should regard the movement in that light, and that they should continue in even greater numbers to avail themselves of the opportunity it gives them for mutual help and co-operation.

Judging the Competition.

In this the initial year there were two sections, viz.:— (1) For best 75 acres of crop; (2) For best 100 acres of fallow. In Section I. there were 10 competitors, and in Section II. 16 competitors, making a total of 26 in all.

As Warracknabeal is situated on the Mallee fringe, there is heavy black land, mallee land, and fringe land between the two. In addition, there is a proportion of red land which is difficult to cultivate satisfactorily. Each is really a class by itself, and no completely satisfactory comparison can therefore be made between exhibits on such dissimilar

soil types. In future it would probably be wise to increase the number of sections to provide for each of these classes.

In judging the crops the following factors are taken into consideration:—The yield per acre, as assessed while walking through the crop, the trueness of the wheat to its type, its freedom from weeds such as wild oats, musk, charlock, &c., its freedom from disease such as smut, take-all, and black rust, and finally its general evenness and regularity. The points allotted under these heads will be found attached. It should be clearly understood that the maximum points awarded for the yield per acre are 35 per cent. of the total, consequently the figures published in the table do not represent the actual yield per acre. The yield of the winning crop was estimated at more than that figure. The differences between the points awarded for yield of the various crops, however, represent as nearly as possible bushels per acre.

A Heavy Crop of Federation.
(D. Kelly's 1st Prize Crop at "Aubrey," Warracknabeal.)

In judging the fallows points are awarded, according to the detailed scale attached, for moisture, for the character of the loose dust blanket, or mulch as it is called, for absence of weeds, and for cultivation, in which particular attention is paid to the tracking of the various implements used and to the consolidation effected in the soil immediately under the mulch.

Results.

Best 75 Acres of Wheat.

Mr. D. Kelly, of Aubrey, is the winner in this section, with a magnificent crop of 80 acres of Federation wheat. This was an exceedingly heavy crop, reasonably true to type, well headed and dense and even. The only fault that could be detected was a rare head of ball smut. This crop was grown mainly on a black flat, but there was also red soil

in the rising ground. The land was summer-fallowed with a disc cultivator in January and February to 3 inches deep. It was then harrowed with set harrows four times. In the spring it was scarified. Subsequently it was left and then scarified up before the drill. Seeding took place in the early part of June with 60 lbs. of seed and 80 lbs. of superphosphate per acre. The summer-fallowing and the skilful use of a light implement such as the harrows are the main factors which are responsible for the heavy yield of this crop. It was fatal last year to work black land deep. This crop forms an interesting contrast with another portion in the same paddock which was worked with similar implements, yet being further from home, it received later treatment. There are several bags to the acre difference in favour of the portion worked up first. It is an illustration which is constantly occurring in the Wimmera of the paramount importance of working the black land as rapidly as possible after rain.

The Second Prize Crop—Federation.
(Grown by T. Pearce, Warracknabeal.)

The second crop is that of Mr. Thos. Pearce, of Kelvin Park, Kellalac. It was grown on a fine paddock of 164 acres of black soil. The interesting feature about this crop is that it is a stubble crop after oats, though to all intents and purposes it was fallow, the oat crop, which was poor, having been fed off in November with sheep. The paddock was scarified after the oats after rain at the end of January to 2 inches deep. It was then harrowed. Subsequently it was scarified in May, and then re-scarified and drilled between the end of May and mid-June. The seeding was 60 lbs. Federation wheat with 112 lbs. super.

The result is an illustration of what can be done on good land on oat stubbles in a favorable year by judicious treatment. It should scarcely need pointing out that such a result is not to be expected in an average year; yet the prospects last year of a bounteous season following on the dry one were so good, and the price of wheat was so high, that these two reasons combined to make the seeding of stubble crops last

year a business proposition that was readily taken advantage of by the keen farmer. The crop was well headed, free from disease, very level, and altogether a handsome one.

The third crop is that of Mr. F. R. Kinghorn; it was grown on a red loamy soil, which, good though it is, can in no way be classed, from a productive point of view in a year like the present, with the rich black flats of the previous two competitors. Mr. Kinghorn's crop, therefore, though not quite so heavy as some of those on the black soils, nevertheless was several bushels heavier than any that were grown on soil of a similar type. In every way it was a show crop, very level, free from disease and clean underfoot. There were a few strangers present.

This crop was grown on well worked summer fallow, and seeded with 95 lbs. Federation wheat and 112 lbs. superphosphate per acre. The summer fallow was worked in the following manner:—Ploughed in January, after rain, to 3 inches deep; scarified in July, spring-toothed in August twice, in September twice, and then harrowed. In June it was again spring-toothed twice and sown in mid-June. There is no doubt that the heavy yield of this crop was largely due to the constant working of the fallow, backed up by liberal seeding and manure.

Details—Section I. Best 75 Acres Wheat.

Competitor.	Soil Type.	Yield.	Trueness to type.	Disease.	Weeds.	Evenness.	Total.
Points	..	35	20	15	15	15	100
D. Kelly, No. 2 ..	Black and red	35	18	12	14	15	94
Thos. Pearce ..	Black ..	32	17	14	10	15	88
F. R. Kinghorn ..	Red loam ..	23	16	15	15	15	84
Lamonte Bros., No. 1	Black and red	26	16	14	13	12	81
D. Kelly, No. 1 ..	Black and red	26	18	7	14	13	78
P. F. Lehmann ..	Mallee ..	21	16	12	11	13	73
Schultz and Son ..	.. ..	21	13	12	13	13	72
Geo. Coutts ..	Red loam ..	22	16	10	11	12	71
W. Fensom ..	Grey loam ..	18	15	8	15	12	68
Lamonte Bros., No. 2	Black and red	16	16	9	10	10	61

Fallows.

There was considerable difficulty in determining a basis of comparison which would be fair to competitors on the various classes of soil.

The winning fallow is that of R. McCollim. The land was a good piece of black fringe country. This fallow, in common with the whole of the others, was high in moisture, partly owing no doubt to the rain which fell a few days prior to judging. But in the remaining points it stood ahead of all competitors. There was an excellent dust mulch of loose mellow earth overlying a well consolidated moist bottom. There was a complete absence of weeds, and examination of the fallow showed that the cultivating implements had been well driven, handled with judgment, and had done effective work.

This fallow was in oats last year, and had been summer-fallowed with a scarifier in February last to 4 inches deep. Subsequently it was scarified in May lightly, spring-toothed in June, scarified lightly in August, and spring-toothed in September and again in November. If sown at the right time with 75 lbs. good seed and 1 cwt. of fertilizer, this paddock should produce an excellent crop next year.

The fallow placed second was that of Mr. T. M. Forster, of Angip. A 220-acre paddock of red loam was shown; it was summer fallow which had been scarified in February, and again in July and August, and springtooth-cultivated twice since and finally harrowed. There was excellent consolidation underneath, the secret of a good Wimmera fallow. The mulch was rather thin.

The exhibit of Mr. R. R. King, Yellingip, was placed third. There was excellent consolidation, but inspection disclosed a somewhat faulty driving and manipulation of the implements used.

The best Mallee fallow was that of Mr. G. Coutts, with that of Mr. J. A. Gould next.

Points were lost by the various other competitors, principally for defective consolidation underneath, caused by working the ground on the dry side. Points were also deducted in some cases for weeds, particularly barley grass—a proved host of the Take-all disease. In many cases the dust mulch was too thin. About 2½ inches was the standard required. On some of the stiff red land competitors had reduced the mulch to too fine a condition, consequently it set hard after the recent rain.

Details—Section II. Best 100 Acres of Fallow.

Competitor.	Soil type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Points	..	**25**	**25**	**25**	**25**	**100**
R. McCollim	Black fringe ..	24	25	25	25	99
T. M. Forster	Reddish loam ..	24	23	24	25	96
R. R. King	Fringe country	24	22	25	23	94
Geo. Coutts	Mallee ..	25	20	25	23	93
Lamonte Bros., No. 1 ..	Black ..	25	20	24	23	92
J. A. Gould	Mallee ..	25	19	25	22	91
M. E. Schultz and Sons, No. 1	Clay loam ..	24	20	25	22	91
Lamonte Bros., No. 2 ..	Black and red	24	19	23	22	88
J. H. Gove, No. 1 ..	Grey loam ..	25	18	23	21	87
F. R. Kinghorn ..	Red loam ..	24	21	23	18	86
Wm. Fenson	Red clay loam	25	17	24	20	86
M. E. Schultz and Sons, No. 2	Clay loam ..	24	19	19	21	83
C. Pederson	Black ..	23	22	24	13	82
J. H. Gove, No. 2 ..	Grey loam ..	24	16	20	15	75
P. F. Lehmann	Fringe, grey and red	24	21	17	13	75
A. Arnold and J. H. Gove	Mallee ..	25	16	17	17	75

Wheat Growing in the Wimmera.

The Summer or Fifteen Months Fallow.

The most successful crops exhibited in the Farm Competitions in the Wimmera during the past two years have as a rule been those grown on well-worked summer fallow. This year in practically every district the heaviest crops are those on summer fallow.

The growers of these crops are strongly of the opinion that the long fallow adds from a bag to two bags to the yield of the crop. The consistent success of the summer-fallowed crops can no longer be ignored by wheat-growers on land that can be summer-fallowed.

In addition to the heavier yield of wheat produced, there are a number of striking advantages which appeal to the practical man. For instance, a much better germination of weeds and rubbish takes place in the loose summer-fallowed soil than in the ordinary winter fallow,

Conserving Moisture in the Fallow.
(Messrs. Schultz and Son's team at work, Areegra.)

and there are greater opportunities to destroy these weeds. The land therefore can be readily cleaned. Further, the distribution of labour is better, since the horses and plant can be employed in February and March, and consequently the pressure of work at seeding and fallowing time is reduced. This latter advantage is, of course, greatest where only a portion of the area to be cropped is summer-fallowed, which is the practice advocated.

Though grass or stubble may be scarified in February and March by summer fallowing, there is a decided gain in April and May. Indeed, in a wet year the growth is occasionally so vigorous as to require well sheeping to prevent the rubbish getting too far ahead. That is the only danger.

So far the practice is usually confined to the friable black land in the Wimmera, but there are considerable areas of friable loamy land in the Mallee and northern districts where the practice would be well worth testing.

Manuring, Fallowing, and Seeding.

Twenty years ago, when superphosphate was introduced into the wheat belt, dressings of 30 lbs. to the acre were found to be all that was needed; but since then a vast change has come over farming practice generally. In particular the careful working of fallow is now routine practice. This creates increased supplies of moisture and plant food—plant food deficient in one thing only, viz., phosphorus. The extra food is useless to the plant unless that extra phosphorus can be supplied. Hence on a well-worked fallow increased dressings of superphosphate should pay, particularly when the price of wheat is high, and in practice they do pay. About 1 cwt. to the acre is advocated for the Warracknabeal district—that is what the subsidy plots at Mr. Geo. Coutts' place, Batchica, have proved most profitable during the past seven years.

But it is no use creating more plant food than the number of plants per acre can utilize; therefore sow a heavier weight of seed per acre. About 75 lbs. of seed per acre for an end-of-May sowing is best, which should be increased a few pounds per week as the season gets later. The results of the experimental field on the black land at Longerenong College have proved this beyond all reasonable doubt.

Large Team used for Harrowing.
(By Messrs. Schultz and Son's, "Home Grange," Areegra, Warracknabeal.)

Take-all and Black Rust.

Our knowledge of Take-all is unfortunately somewhat limited, but we know this much: that take-all and white heads are two forms of the same disease; further, that this disease is caused by a minute fungus that attacks the wheat plant. Sometimes it attacks the young plants—then the crop dies out in patches, to be replaced by sow-thistles, wild oats and other rubbish which grows unchecked in the absence of wheat. Sometimes in a good season the wheat plant lingers on like a consumptive man fed on a bountiful diet, but like him perishes should the conditions become more strenuous.

The fungus gains access to the plant while it is a young and delicate seedling, and its ramifications extend through the tissues until eventually the plant succumbs. The wheat is prevented from seeding, but the

fungus forms its tiny seeds, which can often be seen at the base of the wheat plant as a black incrustation. They are just as significant an indication of this disease as the black balls in the head are a sign of smut.

The black take-all seeds remain on the straw and are then ready to attack wheat or other hosts like barley grass when the opportunity occurs.

The secret of eradicating take-all lies in destroying its seeds before the wheat is next sown. A careful and clean stubble burn helps, but obviously it cannot burn the butt of the wheat stalks completely. A clean, thick oat crop will help to starve the fungus out, because take-all does not often attack oats. But it would appear very probable that a careful turning under of the balance of the straw after the burn, and the light working of the fallow after rain is also most helpful. At

Dense Growth of Wimmera Rye Grass.
(Grown by Mr. A. Milburn, Ailsa, Warracknabeal.)

least that is the general trend of the experience of Wimmera farmers. Possibly the seed of the fungus is thus encouraged to germinate after the rain, and in the absence of wheat or any host plant decays. A fallow well consolidated underneath and free from straw on the surface is the fallow on which to grow a take-all free crop.

Black Rust is somewhat similar in its life history to take-all, and the same remedies help to keep it in check. It can, however, pass through the intestines of horses with its germinating powers unaffected, therefore it is not good practice to cut wheat affected with Black Rust for hay for home consumption.

. . . . . .

In conclusion, I desire to thank Mr. Candy and those who took an active part in the competition for their assistance and hospitality.

FARM COMPETITIONS, KANIVA.

Report of Judge, I. M. Tulloh, Field Officer, Longerenong College.

I have the honour to submit herewith my report on the Crop and Fallow Competitions held by the Kaniva Agricultural and Pastoral Society—Season 1920.

In the Kaniva district the land under cultivation is mainly that known as "black soil" on which occur red patches—some a hard clay, others a light sandy loam. On the flats the soil is heavier and more even, comparing favorably with the Wimmera Plain country, while on the higher land it is a little lighter.

Though high yields of wheat are obtained, the district is not extensively cultivated, partly owing to the land being timbered and partly because sheep-raising forms a big proportion of the industry of the district.

The dry conditions prevailing during the fallow period of last year were largely compensated for by the heavy rains this winter, while the cool spring has been most favorable for the growth and maturing of the wheat crop.

Lack of moisture checked the germination of weeds on last year's fallow, and, as early sowing is common to the district, all the crops inspected had a number of weeds through them—mainly wild oats.

"Take all," though occurring rarely in patches, was distributed through the crops, the plants reaching the stage commonly known as "deadheads." Flag smut was rarely met with, but several crops contained a little stinking smut.

The Competition this season was divided into three sections:—

A. Best 75 acres of crop.

B. Best 100 acres of fallow.

C. 100 acres of fallow 1920 and the crop of 1921—the total of points for both the fallow and crop to be considered.

Best 75 Acres of Crop.

——	Variety.	Yield.	Trueness to type.	Freedom from disease.	Freedom from weeds.	Evenness.	Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
A. W. Goodwin (*a*) ..	Federation ..	31	17	12	10	14	84
R. M. Williams ..	Federation and Dollar	32	17	9	10	14	82
Crouch Bros. ..	Federation ..	29	16	13	10	13	81
H. Crouch	Federation ..	30	16	11	8	14	79
Kennett Bros. ..	Federation ..	28	16	8	11	12	75
A. W. Goodwin (*b*) ..	Federation and Jonathan	25	14	5	8	10	62

Mr. Goodwin entered two crops—one crop (*a*) grown on that portic of his property known as "Whisson's," and the other crop (*b*) grown

the "Nook." Crop (*a*) was sown in a nice even paddock, which had been summer-fallowed in March, 1919, and was scarified at the end of June. It was scarified again at the latter end of July, again late in September, and was then left till sowing time. It was scarified in front of the drill and 57 lbs. of seed and 112 lbs. of super. per acre were sown during the last week in May.

The crop was tall and even, and had stooled and headed well, while the type was fairly good—a few foreign varieties being present.

Mr. Williams' crop was sown on a fine, black flat, a small portion of which had been summer-fallowed and the remainder ploughed in July. It was harrowed twice in August, scarified early in September, and harrowed at the beginning of November. Seventy lbs. of seed and 92 lbs. of super. were sown with the Suntyne combination during the last week in May. This was a tall and well-headed crop, with a tendency to go down in heavy places. A little stinking smut was present, as was also the case in Kennett Bros.' and Mr. Goodwin's other crop (*b*).

Crouch Bros.' crop of Federation was grown on summer fallow, ploughed with a pronged mouldboard plough in March, scarified early in September, and harrowed a fortnight later. It was worked with the scarifier harrows or "duck's foot" at the end of November, and left till sowing time. It was put in with a Suntyne combination early in June at the rate of 60 lbs. of seed and 90 lbs. of manure per acre. This field had rather more red patches than the foregoing ones, but was a very creditable crop, heading well and containing little "Take all."

Mr. H. Crouch had a tall crop on summer fallow sown with 60 lbs. of seed and 104 lbs. of manure. Wild oats were more numerous than in others, and "Take all" was present in a greater degree.

Kennett Bros.' crop was grown on a rather crab-holey paddock, in which there was a number of red patches. On the black ground the crop was heavy, but this was largely counterbalanced by the poorer development on the red soil.

Mr. Goodwin's crop (*b*) was sown on a rather uneven paddock, on which the crop had stooled moderately and had gone down badly. This was the only crop in which flag smut was prevalent.

The Fallows.—Sections B & C.

——	Moisture.	Mulch.	Consolidation.	Cultivation.	Freedom from Weeds.	Total.
Maximum Points ..	20	20	20	20	20	100
Kennett Bros. ..	18	19	16	18	18	89
H. Crouch (*a*) ..	18	18	17	18	17	88
A. W. Goodwin ..	17	16	16	19	17	85
Crouch Bros. ..	17	17	17	16	16	83
A. E. Sanders ..	16	16	15	15	18	80
H. Crouch (*b*) ..	17	15	16	17	15	80
R. M. Williams ..	17	16	17	15	13	78

Owing to the heavy rain during the winter and its frequent recurrence during the spring all the fallows contained a high percentage of

moisture. In a normal season the moisture content of the fallow is mainly governed by the cultural methods applied to it; but the abundant rainfall last season caused the importance of this test to be greatly modified.

On several of the fallows barley grass was much in evidence. As sheep do not eat this readily after it has headed, and as it is a host plant for the "Take all" fungus, enabling it to carry on and increase during the fallow period, steps should be taken to kill this grass by cultivation as early in spring as conditions will permit.

Two of the fallows seen were on crab-holey ground, on which water lay in the holes during the winter. On drying up the surface caked and made working difficult. The home-made triangular grader (mentioned in the report of the Goroke Crop and Fallow Competitions, 1919, by Mr. H. A. Mullett, Chief Field Officer, Department of Agriculture (*Journal of Agriculture*, April, 1920), should be of great benefit for this class of land, when used in place of harrows once or twice during the season.

The season has been a bad one for weeds, and those who owing to local conditions, were unable to get on to the fallow early in spring have had difficulty since in controlling them, several heavy workings continued late into spring being necessary. This has caused the surface to be worked up too deeply, giving the fallow a harsh appearance, and preventing it from attaining that mellow condition which is obtained by lighter surface workings.

Kennett Bros.' fallow was on gentle sloping and even black land. It had been ploughed in February and March and scarified at the end of June; harrowed again early in September, scarified a fortnight later, and harrowed in October. As in the other fallows, the moisture was good. The mulch was of an even depth and in nice tilth, while underneath it was fairly well consolidated. The condition of this fallow was due not to the number of cultivations it had received, which were comparatively few, but to the right implement being worked at the right time. This may also be said of Mr. H. Crouch's fallow (*a*) on which the soil was a little heavier. It was ploughed in March, scarified early in September and spring-toothed twice during October. This was a very good fallow and the land very even. The consolidation was good and the mulch, though uneven in depth, was in a nice tilth. Small weeds recently germinated were showing up.

Mr. Goodwin's fallow was on a rich, black flat which after being ploughed in March had received nine workings. This was a very commendable fallow also, though the mulch on the fine side was rather uneven in depth and consolidation was variable.

Crouch Bros.' fallow was on uneven ground and water had been lying in the crab-holes during the winter. Considering the difficulty in working it, the fallow was in good condition, as was the case with Mr. H. Crouch's second entry (*b*), where similar conditions existed.

On both Mr. Sanders' and Mr. Williams' fallows the mulch was uneven. In the former both the moisture and consolidation were below the average, while on the latter weeds were fairly numerous.

The fallows seen were all of a high standard, the first three leaving little to be desired. The crops, however, though promising heavy yields were rather dirty with wild oats for which the season had been favorable. Early sowing with moderately light seeding which is generally adopted in the district has, in tests carried out on black soil at Longerenong Agricultural College, produced over an average of five seasons, much dirtier crops than late sowings. In addition, the crops have shown a greater tendency to "Take all," while the yields from late sowings made with heavier rates of seeding, have been several bushels per acre better.

Where the land is so situated that it becomes too wet later in the season, early sowing must necessarily be made, but to a big proportion of the cultivated land in the district this does not apply and late sowing could, if more profitable, be carried out. In order to test this, it would be necessary for local plots to be sown, combining time of sowing with different rates of seeding, *i.e.*, four plots sown at 60, 75, 90 and 100 lbs. of seed per acre respectively at the end of May, and four more plots sown with the same quantities of seed late in the season—during the first week in July—all the plots receiving an equal quantity of manure.

I desire to thank the Secretary, Mr. Cordner, and Messrs. Lackman and Curry for the kindly arrangements made in connexion with the judging of this Competition.

ROOT CROPS IN ENGLAND.

Of turnips and swedes in England and Wales in 1920 the estimated yield, 14.4 tons per acre, was 1.4-5 tons per acre above average, and the highest since 1910. Crops were better than usual in practically all parts of the country except in the north-western counties and in Wales, where they were considerably under average. The total production is estimated at 14,200,000 tons, or 3,000,000 tons greater than in 1919, and 1,500,000 tons above the average of the ten years 1910-19. Mangolds suffered considerably in the early stages of their growth from fly and crops were often thin and patchy, but they grew well in the latter part of the season. Over the whole country the yield is estimated at 19 tons per acre, which is practically the same as the average of the previous ten years and 3 tons per acre heavier than in the previous year. Yields were well above average in most counties in the eastern half of the country but were poor in the west. The total production is estimated at 7,292,000 tons, or 1,000,000 tons more than in 1919, but 630,000 tons less than the ten-year average. The total quantity of roots grown in 1920 was therefore considerably greater than in the previous year, and with the large stocks of hay farmers have generally an adequate supply of home-grown winter keep, so the Ministry of Agriculture in its latest agricultural returns declared.

NEW ZEALAND FLAX.

(Continued from page 716, Vol. XVIII.)

By J. Farrell, Orchard Supervisor.

Milling Treatment.

The introduction of machinery for the milling treatment of the Phormium is mainly responsible for the success which has attended the development of the hemp industry in New Zealand. The primitive methods of extracting and preparing the fibre previously employed by the Maoris were too slow and costly to meet modern requirements. During early European settlement in the Dominion many contradictory accounts were current concerning the native method of preparing the Phormium fibre. To obtain reliable information in the matter, the Hon. Colonel Haultain visited the native villages on the west coast of Wellington Province, also Auckland and Hawkes' Bay during 1870-71. The following extracts are taken from his report:—

"In preparing Phormium for the finer purposes, the natives select clean unspotted leaves of a year's or eighteen months' growth, and use the upper portion only, cutting off the leaf about 6 inches below the point where the two blades adhere together, and rejecting the coloured edges and the keel also. They strip the fibre from the upper surface only (that surface which is inside when the two blades are together), cutting the underside across, and then, with the round edge of a mussel-shell, tear up the whole row of upper fibres, bringing away the cuticle also, which has to be removed afterwards.

After stripping the fibre of the upper or right side, it was well scraped with the edge of the shell, to remove as much of the cuticle as possible, and when a small hank of a dozen or twenty leaves had been finished it was thrown into a tub of water to be kept moist until a sufficient quantity was ready to be taken down to a running stream, where it was washed and scraped with the shell over and over again, till all the cuticle, gum, &c., had been removed, when it was hung up to dry, and afterwards worked and twisted with the hand. It took Annie Kanara the greater part of two days to gather leaves and prepare 4 lb. or 5 lb. in weight, and she would not part with it for less than 1s. per lb.

In preparing Phormium for their mats the natives take much more time and trouble than has just been described. They soak the fibre in running water for four days, and then beat it with a stone or mallet; and this process is repeated over and over again for four or five weeks, or even for much longer periods; but I have no doubt that this excessive manipulation weakens the fibre, though it makes it very soft and durable."

The dry process of preparing the Phormium is frequently employed; this consists of stripping the fibre and allowing it to dry before scraping off the adherent vegetable matter, no water being used in the operation. The prepared fibre is in consequence harsher to the feel than the other, and is not so silky in appearance.

In preparing the fibre for rope-spinning, however, the Maoris practically operate on all the green leaves as they come, using mostly

the upper portions and rejecting the butts, and for this purpose the fibre is somewhat roughly stripped and tied up into bundles.

The natives prefer to treat the leaves when the flower-stalks have dried up rather than when the latter are in the succulent state. They say that when the plants have advanced to this condition of growth the fibre is stronger and more easily stripped than while the flower-stalks are green.

Now it is proposed to show the advantages of the milling treatment of the Phormium, chiefly as an effective labour-saving device, by which the leaves are stripped, washed, and scutched by machinery, over the original methods of preparing the fibre. This will be done by explaining the different operations in sequence and by the aid of suitable illustrations.

The Mill.

This is a wooden structure with corrugated iron roof, and a boiler-house built of similar materials is situated near by. The principal divisions of the mill are the engine-room, stripper compartment, scutching chamber, sorting room, grading room, and, below the level of the water supply, the washing and draining compartment.

The horizontal steam boiler in use at Emerald was made by J. E. Cowley, of Ballarat, and the 12 horse-power engine by Robinson Bros., of Melbourne. These, like the other parts of the machinery, are set on substantial cement concrete beds.

Before proceeding to consider in detail the functions of the different parts of the machinery employed in the milling treatment of the Phormium, it might be well to briefly review same, so as to show the contrast between this and the Maori methods of treating the fibre as already explained.

The milling treatment consists of passing the green leaves through the mouth of the stripper inside of which they are gripped between a pair of horizontally corrugated iron rollers revolving at a comparatively low speed. The leaves are thus fed to the stripper drum, which is fitted with iron beaters sloping alternately in opposite directions across its face, and these, revolving at high speed, give a downward stroke. The beaters, as the drum revolves, force the leaves against the beater-bar, and during this operation the cuticles and other vegetable matter are removed while the fibres remain intact. The vegetable matter falls to the pit and the fibre drops on to a canvas conveyer by means of which it is passed through the washing machine. It is then made into field-hanks, allowed to drain, and transferred to the paddock to be bleached and dried. After a few days the fibre is again returned to the mill and scutched in order to remove particles of dried vegetable matter and the tow. After the fibre is scutched and graded it is made into press-hanks, and then into bales, when it is ready for market.

Plate 18 gives an illustration of the Emerald mill, and shows (*a*) the settling drain in which the loose green vegetable matter, having been removed from the fibre in passing through the washing machine, is caught and settles. When the residual deposit accumulates, it is shovelled into heaps, as shown at (*b*), whence it is removed later when dry.

Plate 18.—View of the Emerald mill, and showing, (a) the settling drain, (b) mo...nds of vegetable matter removed from the drain.

In Plate 18A is another view of the mill, (*a*) the situation of settling drain, and (*b*) the compartment in which the fibre is was and allowed to drain prior to being bleached and dried.

Mr. H. B. Murphy, manager for Nobelius and Sons, has had perience in the milling treatment of the Phormium in New Zeala and the washing machine in use at Emerald was designed by him.

To produce fibre of good colour thorough washing before bleach same is essential, and for this purpose a comparatively large body running water is required. This supply was obtained by divert the flow of water in the creek below the mill to the necessarily hig evel for a short distance in an open drain, thence through pipes w n outlet over the washing machine.

Sorting and Stripping the Leaves.

The leaves before being put through the stripper are sorted i different lengths, and each lot is treated separately. This ntial because of the necessary adjustments in the stripper atta t to enable it to deposit the different lengths of stripped fibre y on the canvas conveyer for transmission to the washing mach alone is the work connected with bleaching and scutching f ıced from leaves grouped in this way made easy, but the grad finished product is also facilitated.

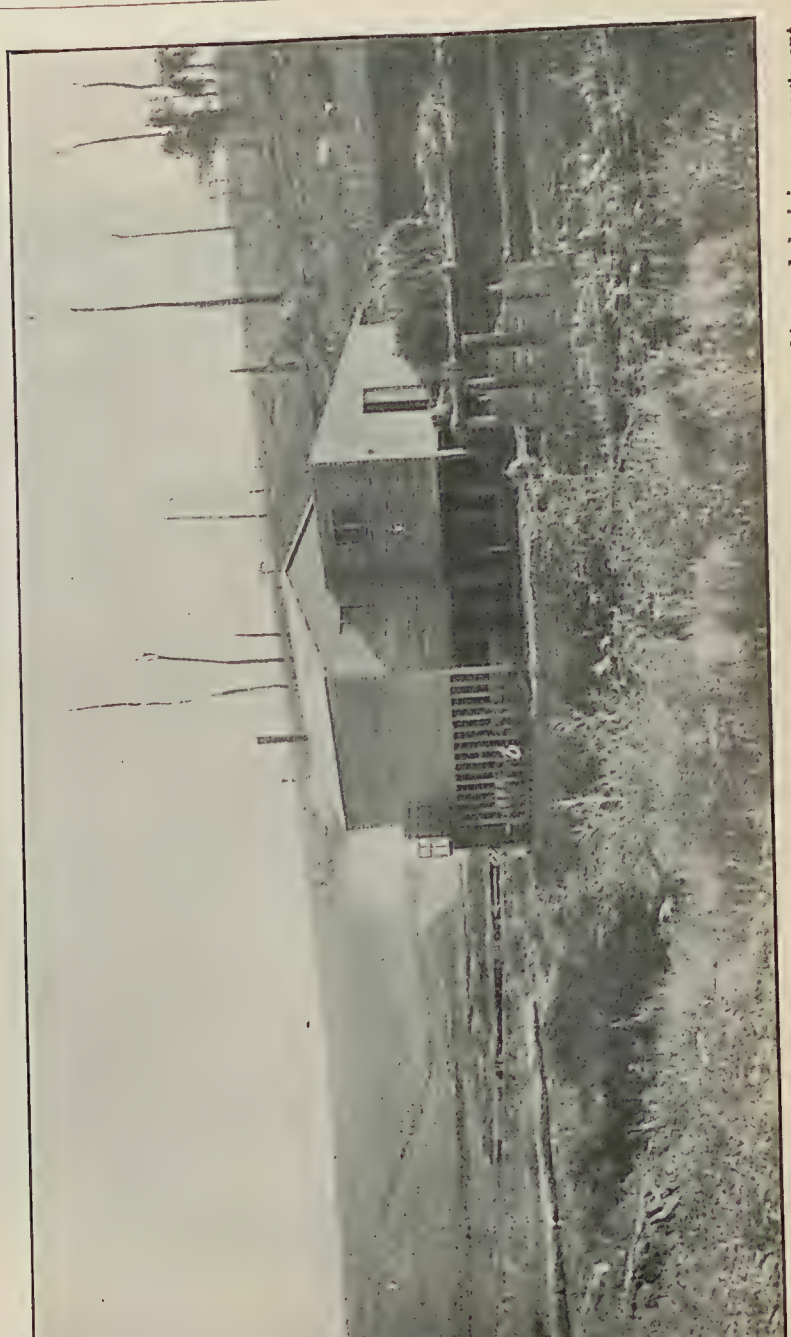
the Phormium is carted from the field to the mill, the shea cked near the sorting-room, so as to be convenient for handl rting process consists of placing a few sheaves at a time, f the bands have been removed, butts downward in a barre into the floor of the sorting-room, as illustrated in Plate . When dropped into the barrel the butts rest on the l hen the operator grasps the longest leaves and lifts them ed in the "first and second acts" respectively. The le placed in whatever section or lot to which their specific le em, and the different lengths remaining are treated simil arrel is emptied.

r to realize what is required in the process of stripping ructure of the leaf should be understood. The enla nd longitudinal sections appearing in Plate 20*, w lustrate the fibre bundles, cellular and spiral tissues, will be found most helpful in this regard. A stri ectly enables the washing machine to thoroughly elimi matter, and this renders the fibre more easily cle by the scutcher.

Professor Hutton made an elaborate investigation tructure of the leaf, and the following extracts ma full-grown condition are abridged from his report:— fully grown the leaf attains a length of from 3 fe ording to the soil and variety. The colour varies f green to deep blue-green, with yellow or red mar , while the lower part of the leaf is usually leaf is linear-lanceolate, and keeled, with an a point less than half-way down from the tip the

* Repro

duced from Sir James Hector's work on *Phormium tenax*.



(a) the situation of the settling drain, (b) the washing and draining compartment.

superior or inner surfaces of the two halves of the blade begin to coalesce at the mid-rib, and this coalescence gradually increases until one-half of the leaf is joined together. The coalescence then gradually decreases until it occupies only about a fourth of the breadth of the half-blades, which breadth it keeps to the bottom

Plate 19.—Sorting the leaf: First act.

of the leaf, the two half-blades being closely appressed as far as the base, where the two marginal edges closely overlap one another, and form a sheath through which the young leaves grow. It is the inner surfaces of the lower portion of the leaf, below the place where the coalescence of the two half-blades begins to decrease, that exude gum.

The full-grown leaf is composed of parenchymatous tissue, in which fibro-vascular bundles lie imbedded, and remain isolated from one another as fibrous cords, some of which run from one end of the leaf to the other. This cellular tissue is covered on both surfaces of the leaf by an epidermis composed of elongated

Plate 19a.—Sorting the leaf: Second act.

rectangular cells, of considerable consistence, but without chlorophyll or other colouring matter.

No stomata or other openings are found on either surface, and the gum appears to exude by exosmosis.

The fibro-vascular bundles, which form what are commonly called the fibres of the plant, are composed of elongated tubular

limber-cells, enclosing a centre of spiral vessels, and vary much in shape in different parts of the leaf. They are surrounded by a layer of elongated cells that at once turn blue with iodine, and are probably cambium cells. The bundles are thickest at the base, and taper gradually to the point of the leaf."

The fibres of all Phormium plants are not of equal strength, as they vary somewhat according to the variety, and that of any variety may vary according to the different ages of the leaves or the degrees of development reached prior to their being stripped. No tests have yet been made in Victoria with a view of determining the strength of fibre yielded from leaves in the different stages of growth, but the

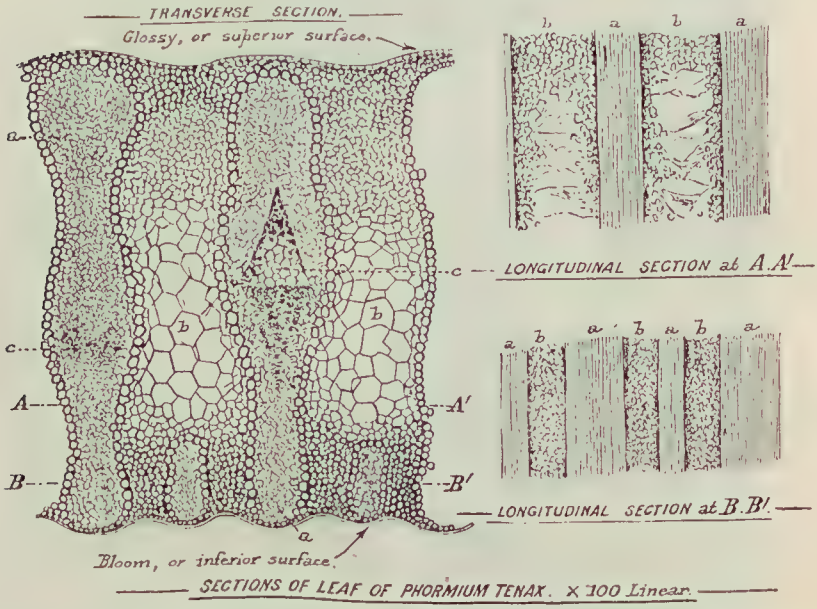


Plate 20.—Structure of the Leaf: (a) Fibre bundles, (b) cellular tissue, (c) spiral tissue.

results of experiments in this regard made in New Zealand are interesting and instructive. The Hon. Colonel Haultain gives the results of his experiments as follows:—

"A few of the centre immature leaves were stripped, and the fibre was very white, soft, and silky, equal to any of the best samples of native-dressed, which have probably been prepared from young leaves of this kind, and could not therefore be obtained in any quantity, even if the natives were disposed to supply it. On being tested for strength, twisted tightly into a double strand in the usual manner, it was found that the fibres of these half-grown plants bore a greater average strain than any of the others, as follows:—

Centre leaf, breaking strain	81
First pair of leaves, breaking strain	70
Second pair of leaves, breaking strain	72
Third pair of leaves, breaking strain	78

As it was impossible that these immature fibres could be as strong as those that were fully grown, it was conjectured that their softness had enabled them to bear a great torsion, and the strands were then tried without being twisted at all; and, though the young fibres proved, as was expected, to be the weakest, yet the whole of the strands bore a considerably greater strain than when in their twisted state, so that it was found necessary to reduce the fibre to one-half, as the spring-balance then in use, which weighed up to 300 lb. only, was not strong enough to break the full quantity of 20 grains to 1 foot. The result was that the untwisted single strand of 10 grains to 1 foot broke as follows, the results, as in former cases, being reduced to a standard of Manila, equal to 100:—

Fibre of centre immature leaf, breaking strain ..	104
First pair of leaves, breaking strain	122
Second pair of leaves, breaking strain	116
Third pair of leaves, breaking strain	113

Since then a different adjustment has been made in the testing-machine; and double strands of native-dressed *Rataroa,* slightly twisted, have borne the following strain before breaking:—

First pair of leaves, breaking strain	104
Second pair of leaves, breaking strain	104
Third pair of leaves, breaking strain	110

These are averages of many trials. The maximum strain was 129, showing that some of the Phormium is far stronger than Manila, or any other fibre of the hemp class."

Being sufficiently conversant with the structural formation of the leaf, we may now proceed to study the mechanism of the stripper and consider the stripping process. When the butt ends of the leaves are inserted in the mouth of the stripper, as illustrated in Plate 21, they are gripped between two longitudinally corrugated horizontal iron rollers 3 inches in diameter and 5½ inches long. These are known as the feed-rollers, and they travel at a speed of about 375 revolutions per minute. The leaves are thus fed to the stripper drum, which is 15 inches in diameter, and armed around its circumference with 23 iron beaters, which slope alternately in opposite directions across its 6½-inch face; the drum travels at a speed of about 1,800 revolutions per minute. The beaters in revolving crush the leaves against a fixed bar, known as the "beater-bar," which is so placed in relation to the beaters that in striking the leaves the epidermis and cellular tissue are mutilated by percussion, and, because of the beaters travelling so much faster than the leaves fed through the rollers, there is also a scraping effect. The striking edges of the beaters are kept round and smooth, properly adjusted to the beater-bar, and sufficiently close to remove all the soft tissue without cutting the fibre. From four to six leaves constitute a "feed," and as these are whisked through the stripper the fibre passes into a stripper attachment, known as the "catcher," which, when properly adjusted according to the length of leaf being treated, correctly deposits the fibre on the moving canvas conveyer for transmission to the washing machine.

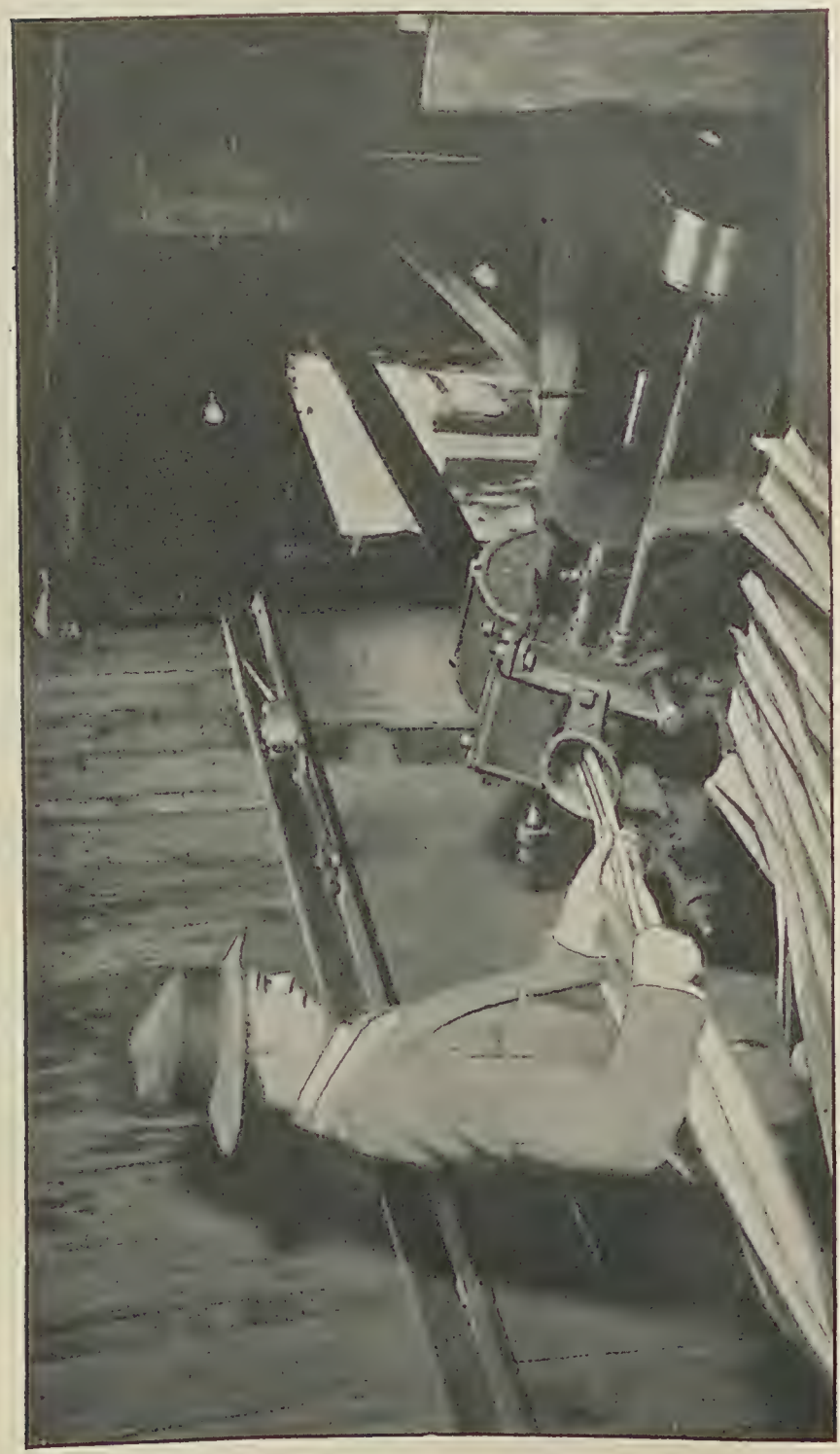


Plate 21.—Feeding the Stripper.

The stripping machine, which gives entire satisfaction, was made by Booth McDonald, of Christchurch, New Zealand; and the catcher is patented by Mr. H. B. Murphy, the mill manager.

In order to ascertain the relative quantity of fibre in the different aged leaves, the Hon. Colonel Haultain tested seven leaves of each growth taken from the same plants. These were weighed and passed through White's stripping machine, with the following result:—

"First pair of leaves, weighing 16 oz., gave 4 oz. of fibre, 25 per cent.

Second pair of leaves, weighing 20 oz., gave 4¼ oz. of fibre, 22.5 per cent.

Third pair of leaves, weighing 12 oz., gave 2½ oz. of fibre, 18.7 per cent.

As the fibres were not thoroughly cleaned, and a great deal of vegetable tissue still adhered to them, this experiment only showed that the relative quantity was greatest in the youngest leaves; and a more exact trial was made in the laboratory with leaves of the *Manunu,* which gave from the half of the—

First leaf, weighing 50.1 grammes, 7.77 grains of fibre, 15.51 per cent.

Second leaf, weighing 60.0 grammes, 10.50 grains of fibre, 17.18 per cent.

Third leaf, weighing 54.3 grammes, 8.30 grains of fibre, 15.28 per cent.

The advantage in quantity was in favour of the second leaf this time, and another trial gave from—

First leaf, weighing 58.55 grammes, 16.26 per cent.
Second leaf, weighing 52.68 grammes, 17.89 per cent.
Third leaf, weighing 36.35 grammes, 19.06 per cent.

Here the third leaf had the largest relative quantity of fibre, but was little more than three-fifths the weight of the first leaf.

Although these various experiments do not give invariable results as to the relative strength and quantity of the fibre from leaves of different ages, yet it may be concluded from them that they are nearly equal in both respects, and may be used indiscriminately in manufacture."

Several kinds of stripping machines have been introduced, but those in use during the later years are mostly identical in principle, varying only in minor details by which the principle is carried out. When large quantities of Phormium are being treated the necessity of keeping the different parts of the stripper in adjustment is obvious.

The New Zealand Government in 1911 agreed to pay £12,000 as a bonus or bonuses for improvements in connexion with—

1. The extraction and dressing of fibre from the New Zealand hemp-plant (*Phormium tenax*), or
2. The utilization of the by-products obtained during the process of extracting the fibre,

on condition that the machine or process in regard to which the whole or any part of the bonus was claimed should be recommended by the New Zealand Flax-millers' Association, and approved by the Government.

The £12,000 to be paid, wholly or in part, for any of the followi viz.:—

1. A process of extracting and dressing the fibre of New Zeala hemp (*Phormium tenax*), whether by machinery or oth wise, whereby there shall be (*a*) a greatly improv quality of fibre marketable at a high price, or (*b*) substantial reduction in the cost of producing the fibr
2. Any such process that shall produce a fibre fit for use manufactures other than rope and twine-spinning.
3. Any such process that shall render unnecessary any of present operations involved in extracting and dress the fibre, such as stripping, paddocking, or scutching.
4. Any improved method of separating the green envelope or flinty or coloured matter from the green leaf of Phormium plant, so as to produce a strong white fil the whole of which can be saved with little or no or waste.
5. Any means whereby the by-products obtained during the p cess of extracting and dressing New Zealand hemp fibr such as gum, dye, stripper-slips, tow-dust, or waste ve table matter—shall be converted into a marketable c modity.

There were thirty-three competitors in the different methods treating the Phormium in the various stages of preparation; and Commission appointed to investigate the different processes and a the bonus, reported,* in connexion with the several flax-dres machines inspected, that none of those were capable of displacing strippers then in general use.

* Report, *Journal of Agriculture*, New Zealand, October, 1914.

(To be continued.)

RE-STOCKING FRANCE WITH CATTLE.

Arrangements have been completed for the shipment of 1, American Holsteins to the devastated regions of France within next four or five months. It is the lack of pure-bred sires whic handicapping the dairy industry in the liberated regions.

There are 112,000 females of various breeds in these sections, r up of English Shorthorn cows, the brindle and white Norman c the Dutch cattle, the German cattle, and American grades. The three are Holsteins, pure-breds and grades.

Good bulls are a scarcity, the scrub sires not only lacking in re of any kind, but particularly in individuality.

The bulls to be donated will be six to eighteen months old, individuals, and free from disease. Registration papers will ac pany each animal. The French Government, through the Min of the liberated region, will take over the animals at the point of barkation. They will see to it that the animals are placed in hands of the best farmers in the various departments in need of bred sires, and make these men responsible to the Government fo care of each bull. More than one farmer will have the opport to breed his cows to these sires, but only one man will be respo for the care of the sire.

HOME WINE MAKING.

By F. de Castella, Government Viticulturist.

At this season of the year inquiries are frequently received for a recipe for the conversion of small quantities of grapes into wine. Even in suburban gardens there are often a couple of trellised vines now laden with grapes, the surplus fruit of which is allowed to go to waste. It is not generally recognised that the conversion of these grapes into sound, wholesome wine is quite a simple matter. In bygone days every English home had its "still room," where the lady of the house presided over the making of domestic wines from gooseberries, currants, elderberries; in fact, from almost every kind of fruit. We even read of such strange beverages as cowslip, parsnip, and carrot wines. Old books on the subject naïvely admit that, for the making of wine, no other fruit can even approach the grape, and in a climate such as ours, where the vine practically grows wild, it is somewhat strange that home wine making is not more widely practised.

Those having conscientious objection to the use of wine need not let their grapes be wasted, as they are easily convertible into sterilized grape juice, often known by the rather ridiculous name of unfermented wine, or into vinegar; wine vinegar is, in fact, the best of all vinegars.

It occasionally happens that the table grape market is over supplied, and that this fruit is obtainable at a very cheap price—5s. per case and even less. A case of grapes will yield nearly 3 gallons of wine, sterilized grape juice, or vinegar, which can be made with little trouble. Much good might be done in relieving a glutted market if this were more widely known.

Growers of dried grapes in irrigation areas may also wish to provide themselves with a supply of wine, grape juice or vinegar. The sultana, vintaged when just ripe, yields an excellent light dry white wine.

Scrupulous attention to two points are all that is needed to insure success. These are—

1. *Absolute cleanliness.*—All vessels in which grapes are handled or their juice is stored, before, during, or after fermentation must be scrupulously clean. Asepsis has transformed Victorian butter; it is just as necessary in wine making, a process in which fermentation plays an even greater part.

2. *Prevention of acetic fermentation* at any stage of the process, but particularly after the juice has become wine. The first or vinous fermentation, which transforms grape sugar into alcohol, is soon followed by another fermentation which converts the alcohol first formed into acetic acid, turning the wine into vinegar. As will be seen below the prevention of this second change presents no serious difficulty.

Given proper attention to these two cardinal points, sound wine is almost certain to result. It is really easier to make good wine in small than in large quantities. Fermentation troubles which sometimes worry the winery manager are usually unknown when wine is made in kegs or jars.

The Transformation of Grapes into Wine.

If this change is properly understood it can be better conducted and controlled.

According to our Pure Wine Act "'Wine' means the product solely of the alcoholic fermentation of the juice or must of fresh grapes." It is the pure juice of the grape transformed by the natural process known as vinous fermentation. No addition of any kind is necessary. Most additions are, in fact, prohibited by law, though the use, in very small quantities, of a few specified harmless substances is permitted. Unlike most other fermented beverages it is not even necessary to add yeast, since nature has provided, in the bloom on the outside of the berry, the yeast organism needed to transform the grape sugar into alcohol—in other words, the grape juice into wine. Pasteur was the first to explain the hitherto mysterious change which has long been known as fermentation.

Surely Providence intended that grapes should be converted into wine. Not only does the ripe grape contain all the necessary constituents such as sugar, acids, yeast, food substances, &c., and usually in the happiest proportions, but it is only at the moment when the changes characteristic of ripening are nearing completion that the yeast organism suddenly makes its appearance on the outside of the berry. Or was it placed there by the Devil, as our prohibitionist friends will no doubt readily concede?

In order to make wine it is thus merely necessary to crush the grapes; nature does the rest. By crushing we disseminate throughout the fermentescible juice the yeast cells, which together with many other organisms are contained in the bloom on the outside of the berry; in due course fermentation commences, splitting the grape sugar into alcohol and carbonic acid gas. The former remains in the wine, giving it its characteristic vinous flavour; the latter escapes in the form of gas, the bubbles of which cause the fermenting mass to appear as though it were boiling; hence the term fermentation, derived from the Latin *fervere*—to boil. The transformation which takes place is shown by the following table*—100 grammes of grape sugar (glucose) are converted during fermentation into—

	grammes.
Alcohol	46.56
Carbonic acid	48.36
Glycerine	3.25
Succinic acid	0.61
Glucose used by the yeast for its constitution, and in the formation of not clearly defined products	1.26
	100.00

Temperature has a most marked influence on the course of fermentation and on the quality of the wine. Excessive temperature during fermentation is the most fruitful cause of unsoundness, and in large wineries in warm districts temperature control is of vital importance.

* Roos—Wine Making in Hot Climates. Translated by Dubois and Wilkinson, p. 8.

At 46 or 50 F. little or no fermentation takes place. Between 59 and 77 F. highly satisfactory results can be relied on. Yeast activity is greatest at 86 F., but this is rather too near the danger limit for safety.

After the lapse of a few days fermentation with its characteristic bubbling, ceases, and if the juice did not originally contain more than 20 or 22 per cent. of grape sugar, practically the whole of it will be converted into alcohol and carbonic acid; the wine will be dry.

The grape juice has now become wine, but a very turbid and unpleasant looking liquid it is, holding in suspension dead and dying yeast cells and other substances no longer soluble in the transformed juice. These gradually sink to the bottom of the storage vessel (cask or jar) where they form a thick sediment known as *lees*.

The clearing of the wine is spontaneous. At intervals of from two to four months the clear wine is racked or decanted its lees into a clean vessel. In order to obtain the absolute limpidity looked for in commercial bottled wines, filtration and fining are usually practised, but these are operations which scarcely concern the home wine-maker.

The transformation of sugar into alcohol is not the only change of importance. There is another fermentation—the acetic—which must be kept constantly in view and absolutely prevented if it is desired to make sound wine. This secondary fermentation is, in fact, the greatest cause of failure in the making of wine in the home.

Just as the yeast splits up the grape sugar into alcohol and carbonic acid so does the acetic ferment convert the alcohol formed during the vinous fermentation into acetic acid; changing the wine into vinegar. If vinegar be the objective the development of the acetic ferment must be favoured and encouraged until the whole of the alcohol has been transformed, but in wine making the greatest care must be taken to prevent any development whatsoever of this secondary fermentation, since the presence of even minute quantities of acetic acid suffice to render a wine unsound or *pricked*.

Fortunately it is quite easy to prevent the development of the acetic ferment; it suffices to protect the wine as soon as it is made from contact with air. Acetification differs radically from vinous fermentation in that it is an oxidation phenomenon, as will be seen from the following formula:—

$$\underset{\text{alcohol}}{C_2H_6O} + \underset{\text{oxygen}}{2O} = \underset{\text{acetic acid}}{C_2H_4O_2} + \underset{\text{water.}}{H_2O}$$

Through the agency of the acetic ferment (which belongs to the bacteria class and not to the yeasts) and in presence of air the alcohol is oxidized or burnt into acetic acid.*

Without air acetification is impossible. Contact with air is prevented by keeping all vessels in which wine is stored completely full. During the whole of the vinous fermentation, even when it is drawing to a close and is almost insensible, the carbonic acid which is being continuously given off, accumulates on the surface of the wine, thus protecting it from contact with air; assuming, of course, that the fermenting mass is contained in a vessel at least partially closed at the top—a jar for example; in an open tub ventilation would soon remove

* Theoretically 100 grammes alcohol should produce 130 grammes acetic acid, but in practice the yield is rather less.

the cushion of carbonic acid though protection would be adequate so long as bubbling of gas was noticeable in the liquid.

In a jar or cask, the narrow aperture of which is partially closed with a flat stone or brick, the carbonic acid is only slowly dissipated into the air, it may afford sufficient protection for some weeks. The presence or absence of the protective layer of gas is easily ascertained by the match test, which will be described later.

Though wine making is essentially a natural process, in fact almost an automatic one, art can come to the aid of nature, and by vintaging at different stages of maturity and otherwise regulating the different manipulations, we can convert our grapes into many different types of wine—red or white, light or full-bodied, dry or sweet.

Red wine is usually made from red grapes and white from white, but it is quite possible to make white wine from red grapes which, in fact, yield some of the choicest champagnes of France. There are, it is true, some vine varieties with red juice, but in the majority of black grapes the pigment is contained in the skin, the juice being colourless.

The fundamental difference between red and white wine lies in the method of treatment.

To make red wine the juice is fermented, for a time at least, in contact with the skins from which it dissolves its characteristic colour.

To make white wine the juice is immediately separated or pressed out from the grapes (white or black) and allowed to ferment alone. It is true that white wine can be, and sometimes is made by fermenting, for a while at least, the juice of white grapes in contact with the skins, but such wines are usually coarse and harsh, and especially in the case of dry wines of moderate strength, they cannot compare with wines made by immediate pressing. The strength and body of the wine, its dryness or sweetness depend on the degree of maturity or over maturity attained by the grapes when crushed.

The practical directions given below are necessarily brief. Those desiring fuller information should consult "Wine Making in Hot Climates," by Roos (translated by Dubois and Wilkinson).* Reprints of several technical articles on wine making are also obtainable on application to the Department of Agriculture. One of these deals with "sulphiting," a process which has greatly benefited wine making on a large scale, and is also applicable when dealing with small quantities.

Degree of Maturity and Condition of Grapes.

The factors governing the character and type of the wine are four in number—1, vine variety; 2, soil and situation; 3, climate; 4, method of making the wine. On the third factor depends the degree of ripeness of the fruit. If the climate be cold the grapes will ripen with difficulty; if it be hot they will easily get over ripe. The riper the fruit the more sugar does it contain, hence the degree of ripeness governs the alcohol strength of the resulting wine.

It may be assumed that the average householder desires to produce a light, dry beverage wine; what we are accustomed to class as a

* Obtainable from the Department of Agriculture, price 1s. 3d., including postage.

claret or chablis according as it may be red or white. The result will really be more similar to French vin ordinaire, but since this type is, unfortunately, practically unknown on our market the above better known terms may be retained. These are the types which can best be turned out from grapes grown in the metropolitan district or from ripe table grapes obtainable on the market.

The degree of maturity is easily ascertained by means of a saccharometer or hydrometer, and the use of this simple instrument is strongly recommended.

The following table gives the sugar percentage corresponding to different gravities of must and the alcohol strengths of the resulting wine:—

Specific Gravity.	Degrees Beaumé.	Sugar.*	Proof Spirit*— Strength of Wine.
		%	%
1·052	7	10·6	10·8
1·060	8	12·7	13·
1·067	9	14·8	15·3
1·075	**10**	**17·**	**17·5**
1·083	**11**	**19·1**	**19·6**
1·091	**12**	**21.2**	**21·8**
1·100	13	23·4	24·
1·108	14	25·8	26·

The stages of maturity corresponding to the figures in large type in the above table are those at which it will be found most convenient to work, though satisfactory wine can be made at a couple of degrees both above and below these gravities.†

For the information of those who find the use of the saccharometer an irksome complication, it may be stated that most early ripening grapes grown in the metropolitan area will, when just ripe but not over-ripe, yield juice of between 10 deg. and 12 deg. Beaumé gravity. If grown on high trellises and bearing a heavy crop the fruit will need to be very ripe before the 10 deg. Beaumé standard is reached. When just sufficiently ripe to be fit for table, the gravity will probably be in the neighbourhood of 8 deg. B.

The natural acid of the grape is a most important constituent of wine; if deficient this will be flat in taste and difficult to clear, if in excess, it will be too tart. Acidity is capable of correction by the addition of tartaric acid, or of a certain proportion of less ripe grapes, in the first case, and by postponing for a while the gathering of the grapes in the second. A simple acidmeter is procurable from the Department of Agriculture. Correction of acidity is perhaps outside the domain of the home wine-maker, and it will be sufficient to here state that the best acidity for wines of claret and chablis types is equivalent to 7½ per cent. expressed as tartaric acid. This is the usual acidity of grapes grown in cool districts, which are just ripe enough to eat, but not over-ripe.

* The figures in these two columns are only approximate.

† It is quite feasible to turn out home-made sweet wines of stronger types, but these will necessitate special treatment, which will be dealt with later,

The sounder and fresher the grapes when crushed the better the wine. Good wine is not to be expected from unsound grapes affected by diseases such as Oidium, Black Spot, Mildew, &c., or damaged by birds or insects. Grapes which from any cause are musty or mouldy are most undesirable. There are, it is true, a few notable exceptions in the case of some special wines.† Mouldy grapes, especially when made into red wine, yield a liquid of unstable colour which turns brown, and is precipitated as a muddy sediment, a disease known by the name of *Casse.*

Mrs. Beeton's Recipe.

What the amateur wine-maker wants, however, is a definite practical recipe which he can put into execution without inquiring too deeply as to the why or wherefore of each operation. Such a recipe is to be found in the appendix to Mrs. Beeton's "*Book of Household Management,*" which, by way of introduction to the practical side of the question, may here be quoted.

Grape Wine.

Mode.—Mash sound ripe grapes well with your hands; or, if not with your hands, with a perfectly tasteless stick of wood. Do not crush the seeds; strain the liquor into a cask, gently squeeze the pulp, pouring the remainder of the juice into the cask (strained). Let it stand aside for a fortnight, then draw it off into another cask, covering up the bunghole with a piece of slate till all fermentation has ceased. Bottle in six months, cork and seal, and it will be drinkable in twelve months' time.

With ripe grapes in good condition Mrs. Beeton's recipe will no doubt result in a sound, wholesome wine, but it would only be a white wine, or with very ripe red grapes, a rosy tinted wine. To make red wine the juice must ferment in contact with the skins. Squeezing by hand is not only laborious but wasteful, since much juice will fail to be extracted; the use of a small press such as can be constructed at a cheap price will result in a far better yield of juice.

Nor are the precautions against acetification sufficient. Without more adequate protection from contact with the air than is provided for the wine could scarcely be relied upon to keep sound for so long a period as six months. This almost classical recipe may nevertheless serve as an introduction to slightly more complex manipulations.

Appliances Required.

For home wine making the plant required is neither complicated nor costly. Fermenting and storage vessels such as kegs or jars are all that are necessary in the case of the simple recipe quoted above. Crushing or mashing of the grapes may be carried out in an ordinary wash hand basin, though for quantities of more than a couple of gallons this would prove inconveniently small and slow.

In order to make a larger quantity, say, 10 or 20 gallons of wine, the following utensils will be necessary:—

For Crushing.—The first operation the grapes undergo is crushing, to set free the juice, which will be subsequently separated from the

† Some celebrated wines, such as Sauterne and the Rhine wines, are vintaged when the grapes are more or less invaded by a grey mould fungus known as Botrytis Cinerea. It is to this fungus that these wines owe their peculiar character.

solid refuse or *marc*. In the case of white wine this separation takes place before fermentation; in that of red wine after fermentation. For crushing a good sized tub will be found very convenient; a large bread pan is also suitable. These are made in sizes of from 2 to 12 gallons, and cost about 2s. 8d. per gallon.

Fermenting Vessels.—These will differ according as the wine to be made is white or red. In the case of white wine the juice ferments alone, usually in the same kind of vessel in which the wine is subsequently stored. These may be either kegs or jars. In the case of red wine, which must ferment for a time on the skins, a vessel with a wider mouth is necessary. An up-ended cask or keg the top head of which has been removed is very convenient, as are also pickle or bung jars; these are made in sizes of from 1 to 8 gallons; they cost about 2s. 8d. per gallon. Bread pans may also be used. Hop beer barrels (earthenware), with a large aperture above and provision for fitting a tap near the bottom, are very convenient for fermenting red wine. They are made in sizes of 1 to 6 gallons, and cost about 3s. 3d. per gallon.

Storage Vessels.—These may be kegs or jars. Wickered jars are expensive, and for home use the bare jars known to the trade as "handled bottles," are to be preferred; these are made in sizes up to 5 gallons, and cost about 2s. 8d. per gallon capacity. For filling up purposes a provision of surplus wine of same character is necessary; hence jars of different sizes will be found useful, say, 5, 2, and 1 gallons as well as a few ½-gallon flagons.

Relative Merits of Wood and Earthenware.

Wood is the ideal material for the storage of wine during the first stage of its maturation. "Cask ageing" is essentially a slow oxidation process through the pores of the wood, which is indispensable in order that high grade wines may develop all their qualities. "Bottle age" completes the maturation, developing other characteristics, mainly the "bouquet" or aroma of the wine.

The porosity of the wood is, however, a frequent source of trouble if the casks do not receive proper attention. A porous surface is a suitable breeding ground for bacteria, mould fungi, &c., and unless scrupulously washed as soon as empty, sterilized with sulphur fumes and tightly bunged before being laid aside, casks are apt to contract various undesirable flavours which they readily communicate to any wine stored in them. Proper care of casks is one of the first duties of the cellarman; lack of proper attention is one of the most fruitful causes of trouble. Unless the home wine-maker is prepared to properly care for casks and kegs he will find earthenware and glass vessels more satisfactory owing to the ease with which they can be cleaned. Though maturation will not be quite so satisfactory the wine will at least be sound and free from taints so easily derived from faulty casks.

Metal Vessels must not be Used.

They are absolutely unsuited for fermenting or storing wine. Even the homely kerosene tin, so often used for picking grapes, is an undesirable cellar utensil once its bright tinned surface has become dull. Wood or papier maché buckets are much to be preferred. The thin tin coating soon disappears, leaving the iron exposed to be attacked

and dissolved by the acids of the wine; the presence of even minute quantities of this metal, though not unwholesome, is a fruitful source of trouble in connexion with the condition or clearness of the wine.

Galvanized iron is far worse than tin plate, since the zinc surface is readily attacked by the acids of the grape. Galvanized iron tubs, buckets, piping, &c., should be ruthlessly banished from the cellar and never used for handling grapes or wine.

The Press.

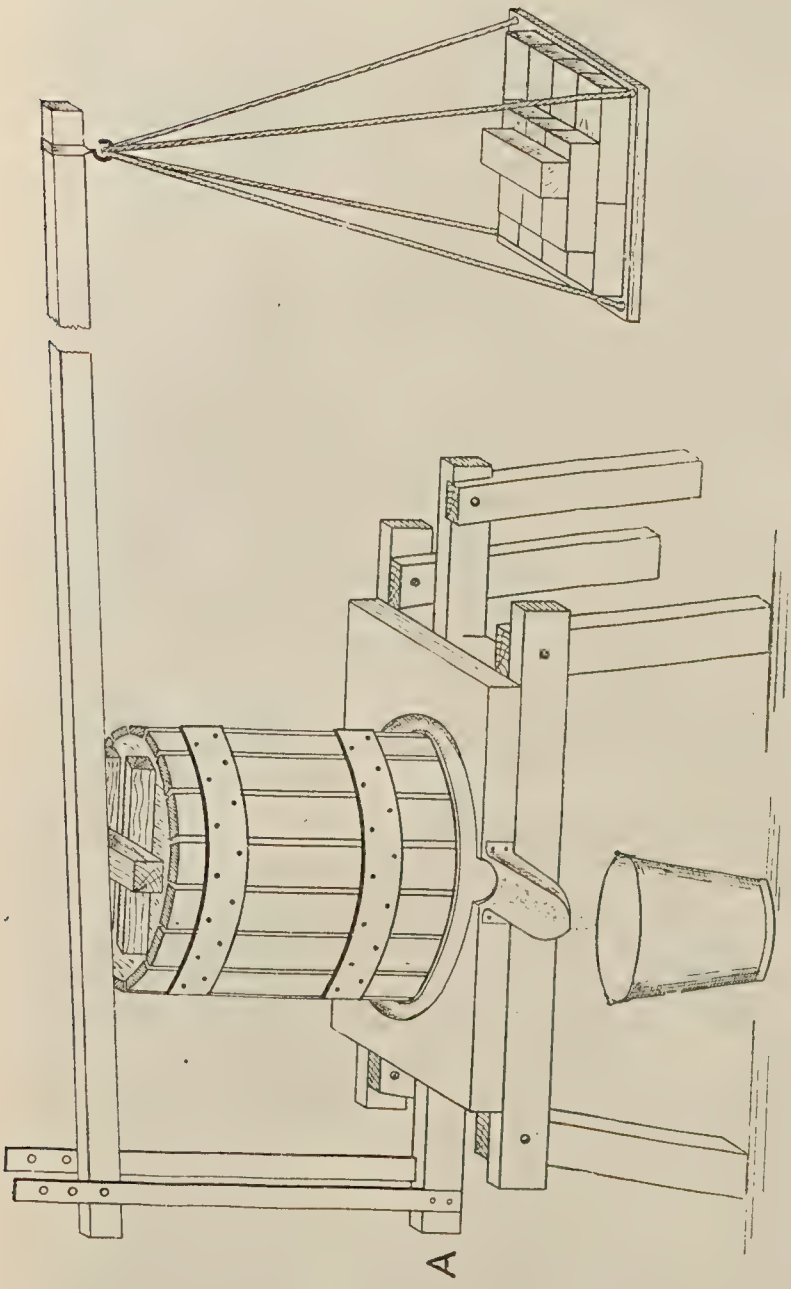
This more or less simple machine has been emblematic of wine making since the very earliest times. Without mechanical pressure a reasonable proportion of the total juice cannot be extracted; too much of it remains in the marc and is wasted. A small press capable of treating a bushel or so of grapes is thus a great desideratum. Unfortunately nothing quite suitable appears to be stocked by the leading hardware firms. A small press may be improvised by fitting an old style office letter press with sides. A primitive press may be also made from a kerosene tin perforated with fair sized holes and without top or bottom. When filled with crushed grapes a square board is placed on top of them, and pressure applied by means of a long lever.

Both these expedients expose the grapes to undue contact with iron, and a simple lever press could be constructed by a carpenter or handy man with a cage of wooden battens of 6 or 8 gallons capacity; this would be quite large enough to make wine in 10 or 20 gallon lots.

A more powerful press is required for white than for red wine. The freshly crushed grapes are viscous and slimy, and the sugary juice is much more difficult to extract than in the case of red wine from the fermented marc of which the wine, much less dense and sticky than the original juice is easily pressed out.

To Make White Wine.

Crush the grapes (stalks and all) in an open tub or bread pan either with the hands or with a clean wooden rammer. Each berry should be broken sufficiently to allow the juice to escape, but the stalks should not be needlessly bruised and torn. If a small press is employed the grapes may be crushed in small lots at a time, and each lot when crushed emptied into the cage of the press from which much juice will drain away without application of pressure. When the press is full, the top is placed in position, the lever adjusted, and pressure is applied. Pressing takes time, and the grapes may remain in the press from 12 to 24 hours. Transfer the juice as it runs from the press to the cask (or jar) in which it will ferment; this must not be filled quite full, but only to within 3 or 4 inches of the bung hole in order to allow room for fermentation, which increases the bulk of the liquid owing to the innumerable bubbles of gas which this transformation liberates. During the currency of fermentation, which usually lasts about a week, the cask must not be tightly bunged; to do so would prevent the escape of the carbonic acid gas (CO_2) and probably burst the cask. The bung hole is lightly closed by a vine leaf with a small flat stone or piece of slate on top of it; half a brick will do. The



A Small Wine Press.

The simple press here figured can be constructed at a price of a couple of pounds. If the long arm of the lever is ten times the length of the short one, weighting with a couple of dozen bricks will apply a pressure of one ton to the grapes in the cage. If the point marked **A** be solidly clamped to a wall, tipping will be prevented.

cask may now be left to itself until fermentation has absolutely ceased when its contents will have lost their sweet taste. The grape juice has now become wine.

Use of a Starter.—Fermentation usually commences quite automatically, a day or so after crushing, and continues for about a week or a little longer. It sometimes happens, however, especially if the weather be very cold, that it only commences with difficulty and after a delay of a few days. This is undesirable since moulds, &c., may start to develop on the surface of the juice meanwhile. In cold weather prompt fermentation can be assured by the use of a starter easily prepared as follows:—

Two or three days before commencing to crush the main lot of grapes gather a few bunches of the best and soundest grapes available (white grapes for choice). Strip the berries off the stalks, crush well, and fill them into a wide-mouthed bottle (quart size), or even into an ordinary jug. Put bottle or jug in a warm place where the temperature will be between 70 deg. and 80 deg. F., but not hotter than 86 deg. F. Fermentation will soon commence as will be shown by the appearance of bubbles of gas. Strain the juice from the grapes, and add the former to the main lot of grapes as they are being crushed.

Addition of Tannin.—Tannin is a necessary constituent of grape juice. In making white wine it is chiefly extracted from the grape during the final stages of pressing. Unless pressing be very thorough the juice may be deficient in tannin, and the resulting wine will clarify with difficulty. More particularly when the juice is separated by primitive methods, such as wringing in a piece of hessian, is this addition recommended. Though not absolutely indispensible the addition of tannin at the rate of 1 ounce per 100 gallons—say, 5 grains per gallon—to the freshly crushed juice will greatly improve the condition of the resulting wine.

Once fermentation is over it is essential to guard against acetification, or turning to vinegar, by protecting the new wine from contact with air. So long as the upper part of the cask (or jar) is filled with carbonic acid gas (CO_2) the protection is sufficient. The presence or absence of CO_2 is easily ascertained by removing the stone which closes the orifice, and gently lowering a lighted match into it. If immediately extinguished, CO_2 is present; if, however, the match continues to burn, there is no longer sufficient CO_2 for safety, and the wine must be either filled up or transferred to vessels which can be kept quite full. Subsequent treatment being the same in the case of red and white wine the two can be considered together in a subsequent paragraph.

To Make Red Wine.

Strip the berries off the stalks, and crush them in the fermenting vessel or vat (a wide mouthed pickle or bung jar or a keg with the upper head removed); as each berry is broken where torn off the stalk, crushing need not be so thorough as for white grapes. Fill the fermenting vessel to within 4 to 6 inches of the top. In cold weather prepare a starter as for white wine, but as soon as this is in fermentation the whole contents of same may be emptied into the crushed grapes; straining is not required. The addition of tannin is not recommended in the case of red grapes.

Immersion of Marc.—The crushed skins soon rise to the surface where they form a thick layer or head; owing to its porosity this is very liable to acetification. This may be prevented in two ways (1) by keeping the head continuously submerged; (2) by repeatedly submerging it. In large wineries the first method is the usual one. A perforated wooden head is fixed in position as soon as the vat is filled. The fermenting juice rises through this owing to the increased bulk, and so long as fermentation is active acetification is impossible, the CO_2 which is continually bubbling through the juice effectively excluding the air.

The second method will be found more convenient by the home wine-maker. It consists in pushing the head down into the underlying juice, and thoroughly mixing the two together, either with the bare hands or with a wooden rammer. After five minutes ramming or stirring the contents of the vat are almost homogeneous though the head soon forms again; three thorough stirrings each day will be sufficient. Between stirrings the vat should be covered with a small tarpaulin or cloth; a clean piece of hessian, preferably doubled, will do. This will prevent draughts, and allow CO_2 to accumulate on top of the porous head, thus protecting it from contact with air.

Duration of Vatting.—The length of time fermentation is allowed to continue in contact with the skins or marc varies greatly. French clarets are vatted for fifteen to twenty days; burgundies for only about a week. The longer the vatting the more colour and tannin will the wine dissolve from the skins, but the longer maturation will it require before it is fit for use. Home-made wines are of the rapid maturing class, and usually drinkable when a few months old; short vatting is therefore to be preferred—two to four days from the start of active fermentation, or three to six days from the crushing of the grapes. *De-vatting* is the term given to the separation of the juice, which is now wine, from the marc. If a keg (open above) or a ginger beer barrel has served as vat the greater part of the wine will drain out through the tap at the lower part of it, leaving the marc ready for pressing. If a pickle or bung jar has served as vat, the marc can be ladled out into the press with a cup; the wine which remains in the vat is poured into a jar after straining to separate it from the few skins still floating in it. The wine obtained from the press is mixed with that which drained off freely, and filled into kegs or handled bottles in which when ready for such treatment it can be securely bunged or corked. Pressing is much simplified in the case of red wine; fermentation has transformed the sticky grape juice and slimy pulp of the fruit into wine which is much more easily extracted from the marc. Even if no press be available a far more satisfactory yield of liquid will be obtained by such rudimentary methods as wringing in a piece of hessian or squeezing by hand, than in the case of freshly crushed grapes.

Subsequent Treatment.

As soon as the disappearance of CO_2 is shown by the match test described above, the wine, whether red or white, must be kept in vessels (kegs or jars) which are completely full and tightly corked or bunged. Two courses are open. The jars may be filled with similar wine or

they may be racked (decanted) into smaller jars which can be kept perfectly full. The second method is to be preferred, since it permits the early separation of the lees or sediment which may communicate unpleasant flavours to the wine.

There is an old saying among advocates of filling up, that the "wine ripens on its lees." This is merely a superstition; no good qualities can be derived from this refuse which, being prone to decomposition, is more likely to prove a source of trouble than to benefit the wine. If occasionally better results seem to be obtained by filling than by racking it is because this latter method mixes small quantities of lees through the wine, and if the weather be warm trouble may result.

The essential is that the wine be kept henceforth, whether in keg or jar, full right up to the bung or cork. If stored in wood, which is porous, the evaporation through the staves will cause a void or "ullage" in the top of the cask which must be regularly filled with similar wine. Filling up is a necessary cellar operation, which in the case of very light wines must be attended to once a week. In jars less frequent filling is required.

Rackings are also necessary in order to separate the wine from its lees. The first racking is the most important, and the proportion of lees then separated is much greater than subsequently; it usually amounts to 4 to 6 per cent. of the total wine. These lees are known as lees of first fermentation or virgin lees. The first racking may be performed as soon as the match test shows that fermentation has ceased; if the wine was then filled it may be left until May or even June, and then racked. Two or three rackings should be given, during the course of the winter, choosing fine and cold weather for the purpose. At each racking, in addition to the thick lees, a certain proportion of cloudy wine will also be separated which must be put into smaller vessels (bottles or flagons are most convenient) to sediment. After a while the clear liquid can be poured off the deposit which will have formed. The more skilful the cellarman the smaller will this proportion of cloudy wine be; if racking is done with the syphon this should not dip into the wine so deeply as to disturb the lees.

Racking and filling necessitates one having, in addition to the main supply of any particular wine, smaller lots of the same quality for filling up purposes. Say, 10 gallons of wine are to be made. A 10-gallon keg should not be used alone, but two or even three smaller ones—say, 7, 2, and 1 gallon each. A sufficient supply of kegs or jars is thus necessary. The work must be so arranged that the whole of the wine can be continuously kept in vessels which are absolutely full right up to the bung or cork.

Towards the close of winter the wine may be bottled, though it will be of better quality if this is deferred until the commencement of the following winter. After bottling lay the bottles on their sides. If carefully decanted before use the wine can always be served in good clear condition.

Sterilized Grape Juice.

Though sometimes called unfermented, or non-alcoholic wine, such terms are illogical. Wine is the fermented juice of the grape; juice which has not undergone this natural process cannot therefore be wine

at all. Nevertheless it constitutes a wholesome beverage which, though rather sweet when consumed alone, constitutes, if mixed in the tumbler with two or three times its bulk of water or soda water, an excellent thirst-quenching beverage, very acceptable in hot weather and much superior to the so-called cordials which are extensively sold.

Its manufacture is very simple and consists merely in the extraction of the juice from the grapes and its sterilization by heat. The natural process of fermentation must be absolutely prevented; in the first place by killing the yeast naturally present in the juice, and in the second by preserving it from contact with the air, which would introduce yeast spores and start fermentation in spite of the first sterilization. After the first heating, which kills the yeast, the juice must be bottled and tightly corked; it must then be subjected to a second heating to destroy any spores of yeasts, moulds or other organisms which may have contaminated the juice subsequent to the first heating. The two heatings realize what is known as fractional sterilization and permit of working at a lower temperature than would otherwise be necessary, hence less alteration in the flavour of the original juice. Though not sufficient to destroy organisms in the *spore* or resting stage, the first heating will kill all those which are in active growth; in other words in the *mycelium* stage. After a rest of twenty-four hours the spores which escape the first heating will have become active and be destroyed by the second heating. Three heatings instead of two permit of working at an even lower temperature and turning out a product of more delicate flavour, but at the expense of a little more trouble. To make grape juice for household use two heatings will be found sufficient.

Degree of Maturity of Grapes.

This will depend on the degree of sweetness required. As grapes ripen, the sugar content increases and the acidity decreases. Over-ripe grapes yield very sweet juice, but it is deficient in acid, and therefore flat and mawkish, and much inferior, to most palates, to the brisker and more acid juice of just ripe or barely ripe grapes. A hydrometer will give useful information; the former type will be produced when the gravity of the must is from 12 deg. to 15 deg. Beaumé; the latter at from 8 deg. to 10 deg. (See p. 93.)

Muscat grapes do not develop their full flavour until pretty ripe; if a "muscat" juice is desired the grapes of this variety should only be picked when quite ripe; they will benefit by being blended with some barely ripe grapes of another variety.

Crushing and Extraction of Juice.

This is done exactly as in the case of white wine (see above). A press will be found most useful and permit a much better yield of juice from the grapes. It is essential that crushing and pressing should be rapidly performed, so that even the first signs of fermentation may not have manifested themselves before the first heating of the juice, which should therefore take place the same day that the grapes are crushed.

First Heating.—Place the juice in a clean preserving pan (copper or enamel); heat steadily until it commences to simmer; do not

allow it to boil. Allow to simmer for ten minutes. Strain while hot through a jelly bag and fill, while still hot, into clean bottles, which may be immediately corked, or this may be deferred until the following day. None but sound new corks should be used, and they must be of the right size for the bottles; do not cork quart bottles with pint size corks. Unless the corks fit very tightly the juice cannot be expected to keep. Taper corks should not be used. A small corking appliance is obtainable from any cork merchant at a cost of a few shillings, and will be found a great convenience; without something of the kind it is not possible to cork the bottles properly. Steeping the corks in boiling water for half-an-hour will soften them and facilitate matters.

If absolute limpidity is required, a quality which greatly adds to the attractiveness of the product, though it does not increase its wholesomeness, filtration or sedimentation must be had recourse to before bottling. Sedimentation will be found most convenient on a small scale. If, after the first heating, the hot juice be rapidly strained through clean hessian, and immediately filled into an absolutely clean jar which has been scalded with boiling water, the juice will usually keep for a week or more without any sign of fermentation. During this time it will become quite clear, and can be poured carefully off the sediment and bottled and corked as above.*

The Second Heating.—On the day following the first heating—or if sedimentation is practised, as soon as the wine is bottled—tie down the corks securely. Fit a false wooden floor in a ordinary washing copper (lining boards will do); stand the bottles on this; fill the copper with water. Heat gradually so as not to break the bottles, until nearly boiling. The temperature should not be less than 200 deg. F. This can be easily checked by an ordinary dairy thermometer. Maintain at this temperature for an hour, then draw the fire and allow to cool without removing the bottles from copper. If the copper is not deep enough for the corks to be submerged the bottles should be covered with bags which fit fairly closely. When cold, remove from the copper, and store with the bottles laying on their sides.

Red Grape Juice.

As described above the grape juice will be white or, if made from very ripe black grapes, of a pale rosy colour. To make red juice it is only necessary to return to the juice, during the course of the first heating, about one-fifth of the berries of the black grapes from which the juice was extracted. These grapes should be thoroughly crushed with the hand or a wooden rammer, but without bruising the pips. The hot juice will dissolve ample pigment from the skins to give it a deep red colour. The amount of pigment in the skins varies according to variety, hence more or less than one-fifth of the grapes may be needed to give colour of the desired intensity.

* If no fermenting grapes are in, or near, the room where the juice has been heated, this plan will usually be found quite satisfactory. In a cellar or a room where wine is being or has recently been made it could not be relied on; there are so many active ferment cells about, that the contents of the jar would be likely to start fermentation as soon as cold.

(To be concluded.)

THE REARING OF CALVES.

By J. S. McFadzean, Senior Dairy Supervisor.

One of the heavy items of loss on many dairy farms is due to inexpert methods of rearing calves, though it is possible for almost every calf to develop into a robust heifer or steer, if only it be given fair treatment. Cattle are naturally hardy, and will pull through a sickness or recover from serious accidental injury that would kill any other farm stock. If given anything like proper treatment, calves will usually grow to maturity without any sickness whatever. But as they are known to be able to endure much rough handling, they are too often given more than they can stand; and, when thus forced to live under very rough conditions, they do not develop properly, and never grow into such good cattle as they would have done with reasonable care.

So little attention will bring calves along right from their birth, maintaining them in good condition and keeping them growing well, that badly-grown cattle should never be seen. The essential points in good calf management are both few and easily remembered, and there is no great expense required to fully observe them. Neglect of them will certainly check the growth of otherwise promising stock, mostly through attacks of bowel trouble, and this, if it does not cause death, will so weaken the vitality of the animals affected that no dairy farmer can afford to overlook the precautions necessary to ward off the trouble.

Amongst stockmen there is much diversity of opinion as to how long a calf should be allowed to remain with its mother after it is born, but it is certain that the sooner it is removed out of the sight of the cow the better it will be for all concerned. The calf certainly can be taught to drink from a bucket with very much less trouble if it is not allowed to get its first drink in the natural way by raising its head to the mother's teats, whilst the cow will not have much memory for the calf if it be removed quickly from her sight. If it once sucks the mother, the probability is that she will hang about the yards roaring for the calf for fully a week afterwards; whereas if the calf be quickly removed from her sight, she will soon join the herd and feed quietly.

It is therefore advisable to have the calf-pen in some other situation than close to the cow-yards, and there each calf should be taken as soon as possible and placed on clean dry bedding. Under natural conditions the calf would find a comfortable place in a bunch of scrub, or in the shelter of a log, rock, or stump; and the pen for the calves should be at least no worse than this. Lying on damp ground is one of the main causes of colds and diarrhœa in young calves, and this should be carefully guarded against, as such troubles quickly cause loss in condition.

There should be a sound roof over the sleeping part of the calf shelter, and a well-drained floor is also essential to success. With all drainage freely carried away, and the sleeping shelter kept dry by good roofing, calves may be allowed to gallop about in any weather for exercise. If the floor of the sleeping pen is only of natural earth, and is at all retentive of moisture, it will be advisable to have

a strip of battened flooring along the rear wall of the shed to keep the calves off the damp ground. If the drainage be carried away properly from below this, and reasonable ventilation and light supplied, the air of the calf-pen will not become offensive, more especially if a little dry lime is scattered about the floor daily. After each lot of calves has gone through the pen it should be thoroughly cleaned out, and lime sprinkled freely over the floor before fresh bedding is put down for other young calves.

It is as well to tie each calf up for a few days at first, about 4 feet of rope with a collar on a swivel being provided for each animal, and fastened some 2 feet above the floor level so that the calf may be less likely to get tangled up in the rope and cast. This early lesson on a tether will do much to prevent the animal struggling when at some later stage it becomes necessary to train it to a rope or halter.

The calf when removed from its mother may be left a few hours before it is fed, but not sufficiently long to cause it to bellow and thereby

Young Jerseys.

attract its mother. If the mother be taken to the milking shed immediately after calving, and given a warm bran mash and milked while she is eating it, she is not likely to trouble further about the calf unless it bellows.

The first milk given by the cow after calving is called colostrum or beesting milk, and sufficient of this should be kept to supply the first two feeds of the young calf. This beesting milk differs considerably in composition from the normal milk of the cow, and has a medicinal effect on the calf as well as being a correctly balanced food for it at this stage; such milk should always be given for at least two meals.

This first as well as all subsequent milk should never be given at a lower temperature than 102 deg. Fahr., a degree higher being better than the slightest fraction lower. Feeding young calves with milk at a temperature below 102 deg. Fahr.—which is the natural heat of milk as it comes from the cow—is another of the frequent causes of derangement of the bowels which results in diarrhœa.

It is always best to heat milk for calves by standing the vessel containing it in hot water rather than by placing it directly over the fire, as milk burns very easily and then calves will frequently refuse to drink it. Further, a more even and quicker heating will be obtained by standing the milk in hot water.

For the first few days the calf should be fed about mid-day as well as in the morning and evening. For average dairy calves two or three pints per meal will be sufficient for the first two days, when the quantity can be gradually increased as the calf requires it, but at no time should more be given than will fill out the hollow at its flank to the level of the rib. No matter how eagerly the calf may be drinking this levelling up of the flank should not be exceeded. Overfeeding is worse than slightly underfeeding, as the former invariably unduly distends the stomach, and is apt to cause indigestion.

When the calf is about five days old, a commencement may be made in substituting skim milk for the new, beginning with, say, half a pint,

Healthy Ayrshires.

and gradually replacing more of the new milk with sweet skim milk each day, until about the end of its second week the calf will be on skim milk altogether. This is the most critical stage of the feeding work; because, while the new milk is being replaced by the skim, some substitute for the cream must be added, and then the digestive organs of the calf have to deal with food altogether different from what nature allowed for. The substitute for the fat in the new milk may be either pollard, linseed meal, or one of the patent calf foods sold for this purpose. Good results may be obtained from any of these if proper care is taken. The patent foods are sold with instructions for their use. Linseed should be boiled until it forms a jelly, and may then be used the same as pollard gruel. Wheaten pollard should be made into gruel by pouring boiling water on it—a little at a time—stirring it meanwhile to mix it thoroughly. A tablespoonful of thick pollard gruel or linseed jelly will be enough to give in each feed when the change to part skim milk is being first made, and this may be increased to a cup-full in the third week of feeding.

This change from new milk to skim milk with pollard or other food must be made gradually, and there are three points connected therewith which should not be overlooked, viz., the temperature of the milk, the risk of overfeeding, and the necessity for the addition of a little lime water to each meal. Lime water is made by putting a lump of fresh lime about the size of an average hen's egg into a gallon of clean water; and it will be ready for use after standing a couple of hours. A supply of this should always be kept on hand. The day before the first change is made from pure new milk to a proportion of skim, about a teaspoonful of lime water should be given in each meal, and the same again next day when the skim milk and gruel is first given. This lime water can be gradually increased till in the third week of feeding with the skim milk and gruel feed, the calf should be getting about half a cupful of lime water in each meal.

About this stage the calf may also be taught to eat; this can be done by giving it a handful of crushed oats or bran in a little clean chaff after each milk meal. If when the milk and gruel allowance is consumed the calf's nose is pushed into a little of this dry feed, it will begin to chew, and will look for such feed regularly after each milk feed. When the calves commence to use this feed the third or mid-day meal may well be dropped if this has not been done earlier; but clean water should be available for their use if the weather is at all warm. A piece of hard salt in the box with the dry feed will also assist to keep them in good health.

This breaking the calves in to dry feed will generally prevent them from sucking each other's ears after feeding, as they usually do if running loose. Some owners have a row of small bails with buckets in front of them in which to feed all calves, and if left standing in these for some little while after the milk is consumed this ear-sucking habit is seldom formed. The habit should be prevented in some such way, otherwise the calves will lose a lot of time in which they might be feeding; and they certainly do better if they are not allowed to contract it.

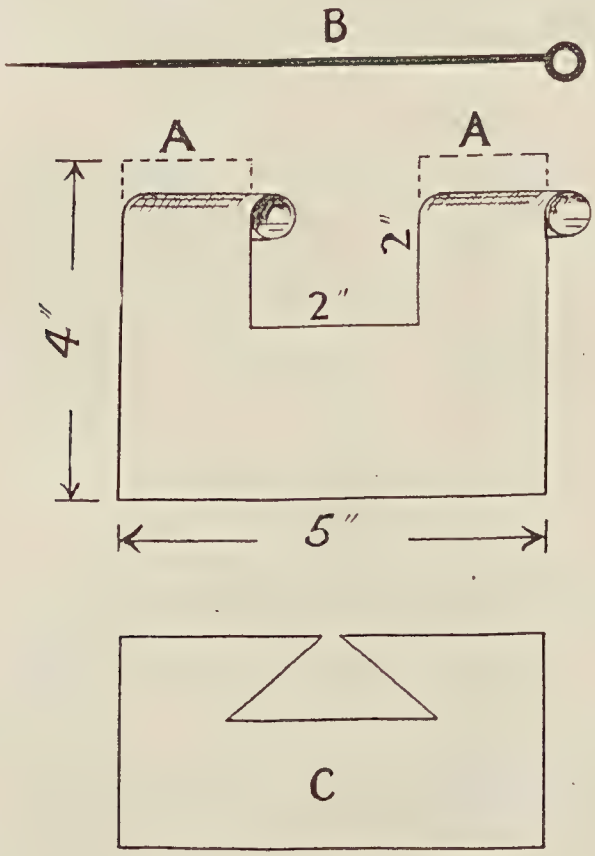
All feeding troughs or buckets should be kept clean. Sour milk or mouldy food is likely to cause indigestion; and all the care previously taken may easily be upset by overlooking some apparently minor detail such as this. It is quite common to see the milk trough in a calf yard in a very dirty condition when a swill out with a bucket water each morning after feeding would have kept it reasonably clean.

To prevent a calf sucking a cow when they are running in the paddock together a device made in the following way will be found effective:—

Out of a piece of galvanized iron 5 inches long by 4 deep cut a 2-inch square piece from one side. File off or otherwise dull the cut edges; then turn over the two top edges at A A, so that they form a small tube which will carry freely a piece of fencing wire B, sharpened at one end to a neat point, and with a small loop at the other. Fix this on the calf's nose by running the wire B through one side of A, then through the thin part of the cartilage of the animal's nose, and through the other side of A, bending over the point of the wire to prevent its

working out. Hanging freely on the calf's nose this will stop the calf from sucking, and it soon learns to feed behind it. Both the wire and the galvanized iron should be heated in the fire for five minutes or so, and then cooled again before putting the arrangement on the calf, to prevent any possibility of the nose festering through dirt being on the iron or pin.

In the case of driving a calf with its mother to market sucking may be prevented by slipping on the calf's nose a piece of thin tough board cut as in C. This would not be of much use on a big calf, as it would soon get knocked off, but as a temporary check it is very handy.



The motto "prevention is better than cure" cannot be too strongly emphasized when discussing the question of calf management. The work should never be left to any one who will not take an interest in the welfare of the stock. Hardy as calves are, even one day of bowel trouble will give a serious set back to a calf's growth, and as the animal grows up with others that have escaped, the effect may be noticed for long afterwards. When, through any cause, derangement of the bowels, as indicated by looseness, takes place, it may most quickly be set right by two or three consecutive meals of fresh milk given as hot as the calf can drink it. This will usually check diarrhœa if taken in time; the

change back again to skim milk and gruel must not be made suddenly or the looseness may recur, but should be effected in about four meals after the trouble ceases.

If the farmer remembers the several points mentioned—viz., not to overfeed, not to give cold milk, to see that the sleeping quarters are dry, that no sudden change takes place in the feeding, and that lime water is never left out of the milk feed—there is little danger of any calf getting sick. These few essentials may be easily remembered by any one who will take an interest in the work. If a calf is worth raising at all, it should be treated so that it will ultimately develop into the best possible animal later on. This part of the farm work is really of special importance, and the person who has charge of it should give it every attention.

FLAX CULTIVATION IN VICTORIA.

The area sown with flax in Victoria increased from 400 acres in 1917 to about 2,000 acres in 1920. The Commonwealth Government guaranteed £6 a ton for standard flax grown this year, and a price which has still to be definitely fixed, but which would not be less than £5 a ton, for next year. In addition it has promised that any surplus obtained from the sale of the flax products over and above the cost of milling and administrative expenses will be returned to the growers in the form of dividends. The growers of the 1918 flax crop, the only one on which complete payments have been made, received in dividends £4 a ton in excess of the guaranteed price of £5 a ton. The guarantee of a remunerative price on the crop for at least two years, particularly in view of the decline in the prices of other farm products, should induce farmers to largely increase their acreage of flax.

Returns obtained by successful flax growers in Gippsland this year show that under suitable conditions the cultivation of flax is a payable proposition. From 2¾ acres, Mr. H. W. Carter, of Buln Buln, obtained 7¾ tons of pulled flax for which he received a cash return of £49 11s. 6d., or an average of nearly £20 an acre. From 11 acres, Mr. E. R. Morton, at Drouin, cut 31¾ tons of crop, which he sold for £222 8s. 6d., an average of over £20 an acre. While the Commonwealth Flax Committee is very anxious that the area sown to flax should be largely increased, it considers that it is still more important that the quality of the crop should be improved and the yield per acre increased. Both these objects may be attained by more thorough methods of cultivation.

Flax should be sown early (from the middle of April to middle of May) on clean land. Unless the land has been previously occupied by potatoes or onions, it should be fallowed and kept well worked until seeding time. The experiences of the last three years should be sufficient to convince growers that it is "worse than useless" to attempt to grow flax on impoverished soil or on land dirty with weeds.

Intending growers should communicate with the secretary of the Flax Committee, 314 Albert-street, East Melbourne, from whom good, clean, acclimatized linseed for sowing may be obtained.

PEACH GROWING IN VICTORIA.

(Continued from p. 16.)

By A. G. McCalman, Orchard Supervisor.

VII.—Varieties.

One of the most difficult problems confronting the prospective growers of peaches is the choice of varieties. A few years ago, in the northern irrigation districts, two varieties were largely planted, viz., Elberta and Pullar's Cling, with the result that, owing to the very large quantities of fruit coming in at the same time, there is to-day a difficulty in disposing of it at a price that will pay.

The Elberta is a freestone; it is a good market peach, and a fairly good canning variety, but the factories prefer clingstones. It is the best of all peaches for drying, and probably large quantities will in future be dried, thus preventing a glut at the canning factories and in the fresh fruit markets. Pullar's Cling is suitable only for canning, and in view of the large area that has already been planted with this variety, new growers should think seriously before deciding to plant any more of them.

In recent years, several clingstone peaches suitable for canning have been tested, and we now have varieties by which a succession of ripening fruit can be had from the middle of January to the middle of April. The following is a list from which intending growers can choose, but it should be noted that some of the newer kinds have not been tried long enough for their suitability to be guaranteed:—

Cling Peaches.

(1) *Tuscan.*—Ripens about middle of January to end of January. It is of good size and colour, the flesh being a bright yellow, with very little red next the stone. This is a new variety, and comes in at a good time for canning—soon after the apricots have been disposed of. Unfortunately, there is a difference of opinion amongst growers as to its suitability, owing to its tendency to produce many irregularly-shaped and small fruits.

(2) *Levi's Cling.*—Ripens a few days later than Tuscan. Fruit on the small side, otherwise an excellent yellow-fleshed canning peach of good flavour. A good cropper. It is free from red next the stone.

(3) *Nicholl's Orange Cling.*—Ripens from about first week to third week in February. A well-known kind. It is a large yellow-fleshed, handsome fruit, with a bright-red flush. The tree is a vigorous grower, and a consistent, but not a heavy, cropper. Has a good deal of red next the stone.

(4) *Sim's Cling.*—Ripens from about 20th to end of February. A new variety which promises well. It is a good cropper. Free from red next stone.

(5) *Phillips Cling.*—Ripens about 25th February. A large yellow-fleshed variety; excellent for canning, but rather a shy cropper.

(6) *Goodman's Choice.*—Ripens from about 28th February. A yellow-fleshed cling, with a beautiful golden flesh. This is a new

variety, which is inclined to run small if carrying a heavy crop. It apparently requires good soil and generous treatment. Of excellent quality for canning.

Fig. 7.—Tuscan Cling.

(7) *Golden Queen.*—A recent introduction. Ripens about 1st March. A large yellow-fleshed cling, of good canning quality. The tree grows well, and is a good cropper.

(8) *Pullar's Cling.*—Ripens about 5th March. A large yellow-fleshed cling. The tree is a good grower and heavy cropper. Being

very suitable for factory use, it has been planted more than any other clingstone.

(9) *Healesville Cling.*—Ripens about the same time as Pullar's Cling. A heavy cropper, but the fruit is not as large as Pullar's.

(10) *Riverside Red Italian.*—Ripens from towards end of March to mid-April. A recent introduction, which, if found satisfactory, will prolong the canning season.

Cling peaches are not suitable for canning if there be much red round the stone, as this has to be cut out, otherwise it will spoil the colour of the syrup and appearance of the canned article. White-fleshed clings are not suitable for canning, and none has been included in the above list. The times of ripening are given as nearly as possible, but this will vary somewhat with the season, district, and class of soil.

Freestones.

The following is a list of freestone varieties, suitable for the fresh fruit market, and including a few suitable for drying. Some of these are also suitable for canning, but, as previously stated, the cling peaches are preferred when available:—

Sneed.—A medium to small white-fleshed freestone. Ripens towards the end of November. Rather lacking in colour and flavour, and bruises easily, so that it must be picked hard if intended for marketing at a distance. It is only suitable for planting in sandy soils in an early district, so that it may be marketed before better varieties come in. The tree crops well.

Brigg's Red May.—Ripens about first week in December. A highly-coloured, medium-sized dessert peach, of good quality. A semi-freestone. The tree is a shy cropper on free soils, as on such the bloom-buds frequently drop out in the late winter. It crops better on heavy soils.

High's Early Canada (Syn. Saunders).—This closely resembles Brigg's Red May, ripening at the same time. It is a good cropper, and is now usually planted in preference to the latter.

Alexander's Early.—This resembles Brigg's Red May, but has been discarded, as it is a poor cropper.

Amsden's June.—This is also a shy cropper, and has been discarded.

Early Rivers.—A white-fleshed freestone of fine dessert quality, but unsuited for market, as it bruises too easily.

Early Silver.—Like Early Rivers, it bruises readily, and has been discarded.

Hale's Early.—Ripens towards end of December. A medium to large semi-freestone of excellent dessert quality. Resembles Brigg's Red May, but is larger, and of better quality. Largely grown, especially in the vicinity of Melbourne, for marketing fresh. Like Brigg's Red May, it is subject to bud dropping, but not to the same extent.

Wiggins.—Ripens about the same time as Hale's Early. It is a white-fleshed, medium-sized peach, inclined to run small, and somewhat lacking in colour. The tree is vigorous, and a heavy cropper.

Triumph.—Ripens about end of December. A large yellow-fleshed variety. It is a shy cropper, with a very fluffy skin.

Admiral Dewey.—Similar to Triumph, and ripening with it.

Zerbe's Early.—A medium-sized, white-fleshed dessert peach, following Hale's Early, ripening about the middle of January. The tree is a good cropper.

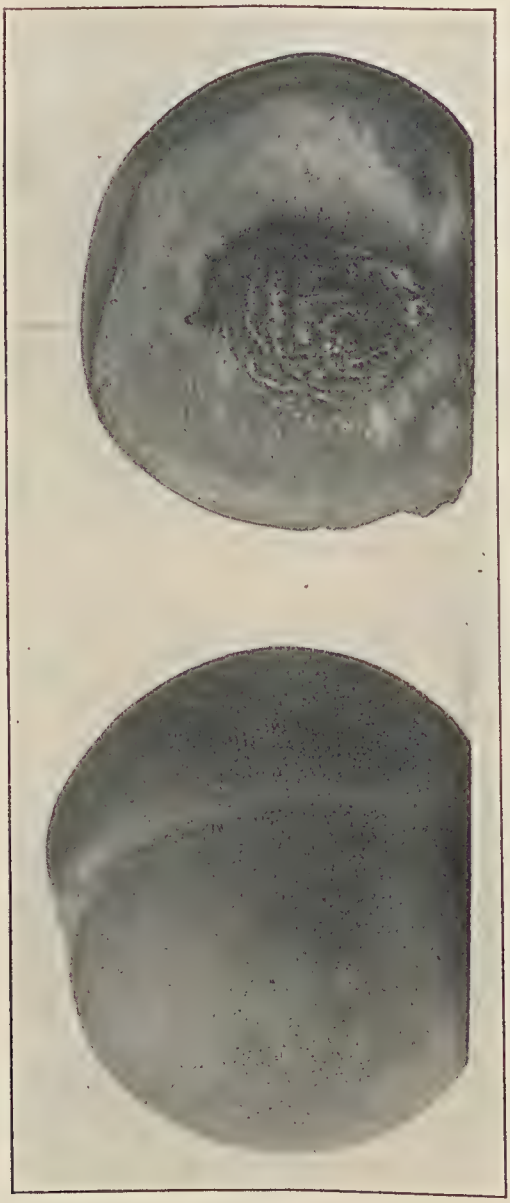


Fig. 8.—Hale's Early.

Louis Grognet.—A somewhat large white-fleshed variety, ripening early in January. It is rather a shy cropper on free soils. The wood is brittle, and snaps off readily if the tree be pruned hard so as to induce sappy growth.

Early Crawford.—Ripens about mid-January. A large, yellow-fleshed freestone. It is a good cropper, but as the trees get older a large proportion of the fruit fails to attain full size, and this fruit is of poor colour and flavour. A great many fruits set in pairs. For these reasons, it is not much grown now. It is suitable for dessert and canning if well grown.

Foster.—Closely resembles Early Crawford in appearance and habits.

Conkling.—Ripens with Early Crawford. It is a large yellow-fleshed freestone, and may be used for canning and dessert.

Reine de Verges (Syn. Grey's Late Red, Wadeson's Late, Zerbe's Late).—Ripens about 20th January. A rather large white-fleshed dessert freestone peach, with a bright-red flush. A good dessert variety, with a somewhat acid flavour. Rather a shy cropper on free soils.

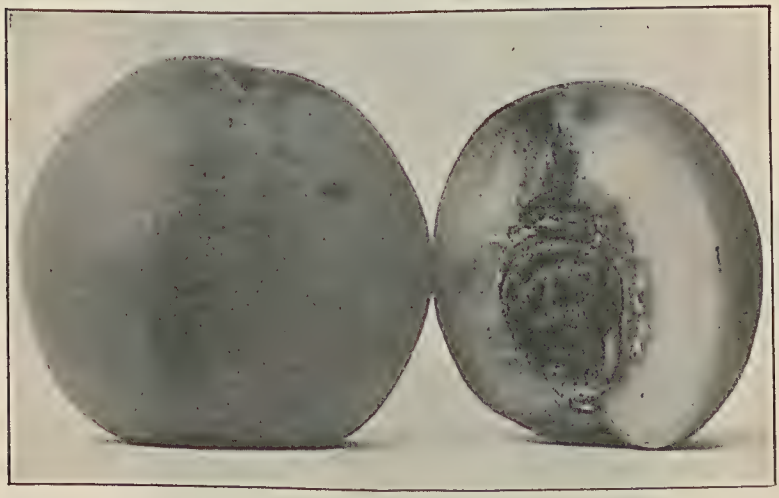


Fig 9.—Wiggins.

Pump's Seedling.—Ripens towards the end of January. A sweet, white-fleshed dessert peach, largely grown in the vicinity of Melbourne. The tree is a good cropper.

Peregrine.—Ripens about 20th January. A white-fleshed freestone, of good quality, and a fair cropper. Fruit inclined to run small.

Elberta.—Ripens from about 24th January. A large, oval, yellow-fleshed freestone. The tree grows vigorously, and is a heavy and consistent cropper. This is the best of all peaches for drying, and is also used largely for canning at present, and sold as fresh fruit. Has been very largely planted.

Kia Ora.—Ripens about five days after Elberta. It is a seedling from Elberta, and closely resembles it in every respect, though somewhat rounder in shape.

Belle of Georgia.—Ripens with Elberta, so is not largely grown. A white-fleshed freestone, with a red flush on the skin. Suitable for dessert.

Susquehanna.—A large yellow-fleshed variety, ripening with Elberta. Forms numerous double peaches, and is not a good cropper.

Late Crawford.—Ripens at the beginning of February. A good-quality, yellow-fleshed peach, but inclined to run small. It is rather tender for canning.

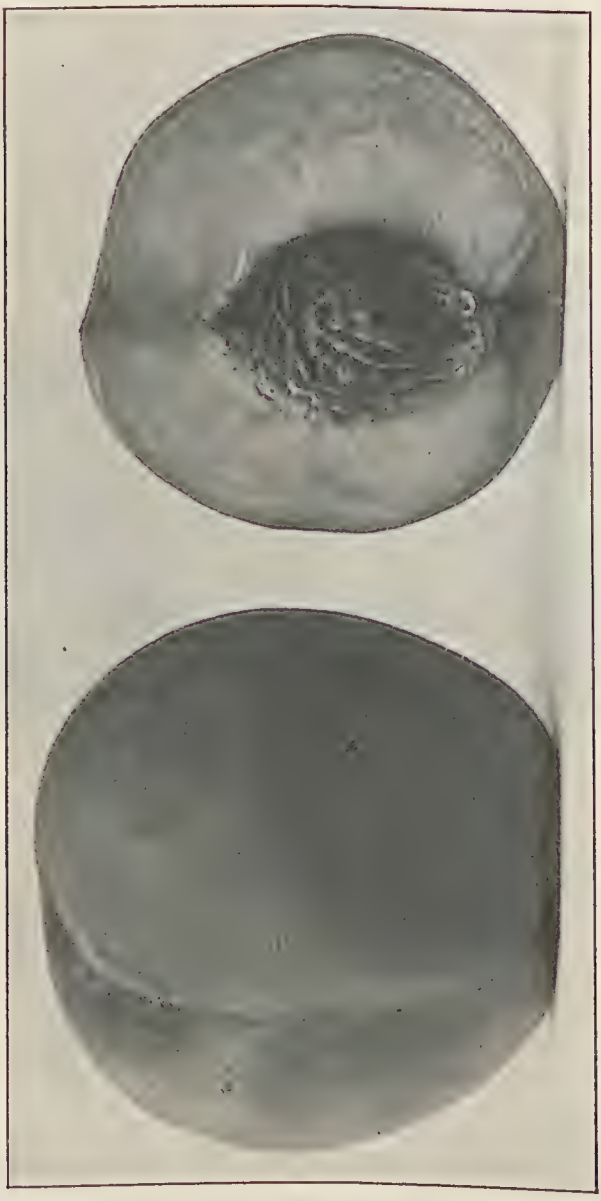


Fig. 10.—Louis Grognet.

Nectarine Peach.—Ripens at beginning of February. A white-fleshed dessert peach, with a greenish skin, having a red flush. It is of good dessert quality, but is not a good cropper.

Royal George Freestone.—Ripens at the end of January. A white-fleshed freestone, with a red flush. The tree is a good cropper, but the fruit tends to become small. The flavour is excellent.

Muir.—Ripens first week in February. A large yellow-fleshed freestone. It lacks colour, and is of poor quality for dessert, but excellent for drying. It is a heavy cropper. It is peculiarly subject to attack from the Rutherglen Fly.

Waitako Champion.—Ripens about the beginning of February. It is a large yellow-fleshed freestone. Of fair quality for dessert, and may be canned.

Chair's Choise.—Ripens about 10th February. A large yellow-fleshed freestone, with a good colour. The tree is a good cropper. Of fair dessert quality, and may be canned.

Globe.—Ripens about the beginning of February. A large yellow-fleshed freestone. The fruit sets in clusters on the ends of the laterals, and the variety is not favoured by growers.

Wonderful.—This closely resembles Globe, and ripens with it.

Lady Palmerston.—Ripens about the second week in February. A large yellow-fleshed freestone, with a fair colour. The tree grows well, and is a heavy cropper. It is of good quality for dessert, and may be used for canning.

Shipley's Late Red.—Ripens about mid-February. A large white-fleshed freestone. The skin is rather hairy. It splits badly if rain falls shortly before it ripens. Quality for dessert is good.

Comet.—Ripens about the third week in February. A large yellow-fleshed freestone peach, resembling Lady Palmerston, but somewhat larger and rounder. It is of fair dessert quality, and may be canned. The tree is a good cropper.

Golden Eagle.—Ripens with Comet. A large yellow-fleshed freestone. The tree is a heavy cropper, and the fruit may be used for dessert and canning.

Cope's Late Red.—Ripens with Comet. A yellow-fleshed freestone. The tree is not vigorous.

Salway.—Ripens about the first week in March. A large yellow-fleshed freestone. It grows well, and is a heavy cropper, but the fruit is subject to splitting in a wet season. Suitable for dessert, and may be canned.

Bonanza.—Ripens about 6th March. A white-fleshed freestone, suitable for dessert. The tree is a good cropper.

Hawkesbury Champion.—Ripens about the middle of March. A large white-fleshed freestone, suitable for dessert. The fruit is subject to splitting.

Nectarines.

Early Rivers.—Ripens second week in January. A large white-fleshed, yellow-skinned variety, with a crimson flush. The tree is a good cropper, and fruit of excellent quality.

Ansenne.—A large nectarine, of good quality, but a poor cropper. The tree is delicate.

Cardinal.—A rather small early variety. Very subject to splitting.

Goldmine.—Ripens about the middle of January. A large freestone, with a creamy flesh and red flush on the skin. The tree is a

good cropper, and the fruit of excellent quality, with a small stone. Excellent for dessert, and dries well.

Precose de Cronsels.—Ripens early in January. Is of dark-red colour. The tree is a fair cropper, and fruit of good size.

Surecrop.—This is almost identical with Goldmine.

Newboy.—Ripens about the same time as Goldmine, and resembles it. It is a good cropper.

Ohmstead.—A good-quality late variety, but a shy cropper.

Victoria Rivers.—A large late variety, of excellent quality.

This list of peaches and nectarines by no means exhausts the good varieties of fruits. The intending grower should endeavour to find out what varieties do best in his district, and whether they will suit the market which he desires to supply. Many of the varieties mentioned have serious faults, or come in at a time when better kinds are ripe, and have been included so that growers will know that it is advisable not to plant them. Thiele's Cling is one that is grown largely

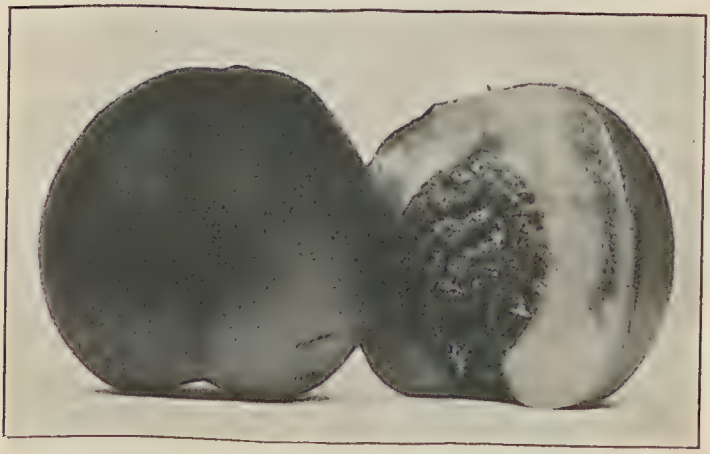


Fig. 11.—Early Rivers Nectarine.

in the districts near Melbourne, and takes the place of Pullar's Cling, grown in the north. It is a good canner, and resembles Pullar's Cling closely. McDevitt's Late Cling is said to do well in the south, while it is unsuitable in the north, where it has proved to be very shy.

It is not advisable to plant a large number of varieties on a small area, but to have at least half-an-acre of one sort, and preferably much more. The most satisfactory plan is to have a succession of varieties, and half-a-dozen kinds will give such a succession over about four months. This is advisable, especially for cling peaches for canning, so that the factories may be able to deal with the fruit over a long period, instead of having a rush for a couple of weeks and then a dearth of fruit.

A grower who has varieties ripening in succession is often able to do all the harvesting with the aid of his family without the necessity of employing outside labour. For a block of 20 acres, from four to six varieties are ample.

Where irrigation is practised, the rows should be planted in the same direction, so that the water can be run to these in the furrows, and they should be so arranged that any one variety may be irrigated separately if desired.

Although most yellow-fleshed freestones are classed as dessert varieties, white-fleshed peaches are to be preferred, owing to their generally superior eating qualities and appearance. Growers near a good market are at a great advantage over those who have to send dessert peaches long distances by rail, as the former are able to let the fruit hang on the trees until nearly ripe, and therefore it will have a good colour and flavour when sold. The following white-fleshed freestones give a succession in the ripening period from early in December till towards the end of February:—High's Early Canada, Hale's Early, Zerbe's Early, Reine de Verges, Pump's Seedling, Shipley's Late Red.

FARM NOTES FOR DECEMBER, 1920, AND JANUARY, 1921.

Harvest Results and Notes on Experimental Work at State Research Farm.

G. S. Gordon, Science Field Officer.

Seasonal Conditions.

With the exception of a few very hot and trying days, the weather during harvesting operations was fairly good, and the work is now almost completed. Stripping was delayed to some extent by rain and damp conditions, but no rough weather occurred. The standing grain crops, however, suffered by the delay, and in the Green Manurial Rotation Field the wheat plots "lodged" badly in wet places, and had to be cut with the binder for thrashing; the stud barley plants also went down badly. The rainfall for the last month of 1920 was 123 points, which brought the total for the year to 21.69 inches—about 1½ inches more than the average for the district. At the end of July the rainfall was 8.15 inches, so that 13.54 inches fell during the last five months of the year. The precipitation during the latter period was, at times, in excess of requirements, and the crops were killed out on low-lying patches which could not be drained. At the same time there is no doubt that the abundant spring and early summer rains materially helped to produce the fine crops which have been harvested. The rain was also of use to summer crops, such as lucerne, and reduced the number of irrigations; but, on the other hand, the accompanying cool weather seems to have somewhat retarded the growth of this crop. Three to four cuttings have already been obtained from most of the plots, but the growth does not seem so high as in previous years.

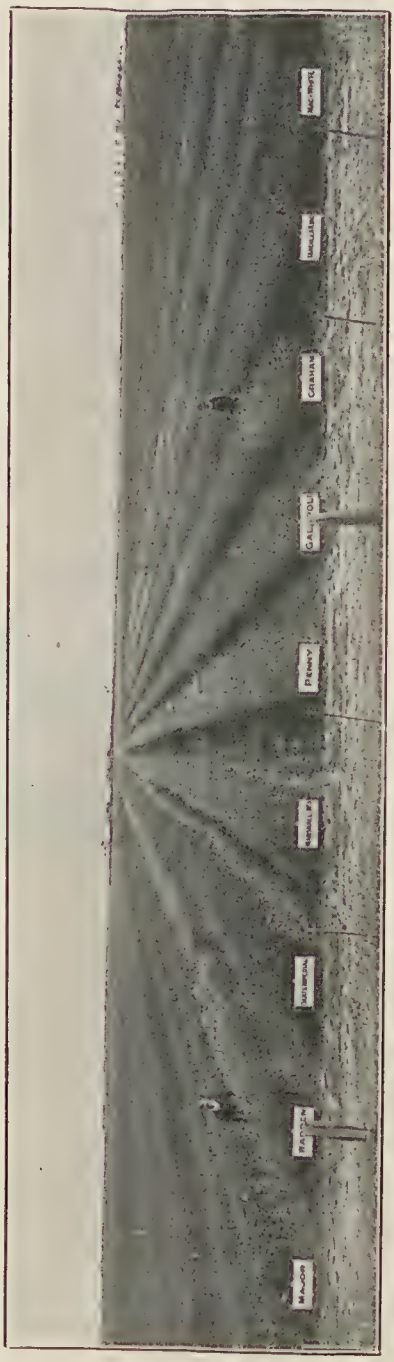
A summary of the Meteorological Observations for 1920 and comparison with previous years is given on page 125. The new year has started well with 305 points of rain for the month of January, and

fallow cultivation has been carried out to conserve as much of this moisture as possible.

"Wheat Selection" Plots, 1920.

The results from these plots are recorded in order of yield in Table No. 1 below. The wheats included the best standard varieties and new crossbreds and selections which have survived the tests in smaller plots. Sufficient typical heads are hand picked from these plots to provide seed to re-sow the plot next year. The balance is stripped, and provides the seed for the larger "Variety" plot. Some particularly fine yields—records for the farm, and probably the district—have been obtained this year, and an encouraging feature has been the fact that so many of the new crossbreds and selections are near the top of the list. Some of the plots are shown in Plates Nos. 1 and 2 herewith, and a few of the outstanding features may be mentioned, as follows:—

The season favoured late, rather than early, maturing varieties, and proved a somewhat severe test for rust resistance and strength of straw, while the abundant rains gave no opportunity for drought-resistant varieties to assert their superiority. Consequently some of the varieties and crossbreds which previously yielded well are this year comparatively low on the list. Plots Nos. 24 and 33 (second and third on the list) are, however, exceptions to this. Both of these crossbreds have done well in dry years, but will be further tested and improved before being distributed.



No. 1.—Selection Plots.

No. 2.—Promising Crossbreds in Selection Plots.

The comparatively low average yield of 39 bushels 10 lbs. from the four Federation check plots may be accounted for by the fact that this well-known variety does not seem to suit the district quite as well as the Northern areas, and this season it was badly affected with rust. Federation Selection No. 9, however, came ninth in order of yield, although it seemed to be affected to a greater extent than the check plots of typical Federation.

The yields from the different plots of Gallipoli vary according to the inherent characteristics of the particular selection, and also according to the ease with which it threshed. This crossbred has given particularly fine yields for some years, but the bulk strain is not absolutely "fixed" or pure in regard to type, and at times has proved difficult to thresh. A large number of Gallipoli selections have, therefore, been tested, and from these apparently pure strains have been isolated. Some show the characteristic features of typical Gallipoli; others are not only quite different in appearance, but are also easily threshed. Selection 58/1, which heads the list with 56 bushels 43 lbs., is a light-brown, tip-awned, rather attractive wheat. The plots sown with seed obtained from the winning sheaves at the Royal Agricultural Show in 1919 (Plots 41, 42, 43, and 44) have done particularly well, and serve to indicate the advantages of graded seed from selected heads. The results this year should encourage greater interest in the Competition at future Shows.

Table No. I.

Wheat "Selection" Plots.

Grown in Field No. 8 N.E. Season 1920. Area of nearly all plots equals 1-20 acre.

Cultivation.—Disc ploughed, July, 1919. Disc cultivated, December, 1919, and January, 1920. Spring-tooth cultivated and harrowed before and again harrowed after drilling.

Fertilizer used.—Superphosphate, 140 lbs. per acre.

Seed pickled with 1¼ per cent. solution of bluestone and sown at the rate of 60 lbs. per acre during period 22nd to 26th May, 1920.

Plots harvested with stripper, 12th to 28th December, 1920.

Rainfall during growing period, June to November inclusive, equals 14.66 inches.

Plot No.	Order of Yield.	Record No.	Variety or Pedigree.	Yield per Acre.	Remarks.
				bush. lbs.	
19A	1	Seln. 58 / 1	Gallipoli	56 43	
24	2	L4119 / 2	Indian F × Federation ..	56 20	
33	3	L4036 / 4	Indian H × Telford's ..	53 40	
43	4	..	Major	53 40	Exhibit from Royal Agricultural Show, 1919
46	5	W3013E / 2	L4119–2 Ind. F × Federation / L4054–4 Ind. E × Telford's	53 33	Sown 23rd June
44	6	..	Joffre	52 40	Exhibit from Royal Agricultural Show, 1919
39	7	W3342C / 4	Hard Federation × Indian H	50 40	
48	8	..	Gallipoli (typical selected) ..	50 0	
21	9	Seln. 9	Federation	49 40	
3	10	..	Major	49 20	
47	11	..	Huff's Imperial	49 20	
5	12	..	Dart's Imperial	49 0	
42	13	..	Major	48 39	Exhibit from Royal Agricultural Show, 1919
10, 30, 50	14	..	Yandilla King	48 26	Average of 3 check plots
6	15	..	Marshall's No. 3	48 0	
38	16	W4342C / 2	Hard Federation × Indian H	47 40	
49	17	Seln. 14 / 2	Gallipoli	47 20	
19	18	..	Thew	47 0	
26	19	L5021C / 1 / 1	Huguenot × Federation ..	46 0	

Table No. 1—*continued.*

Plot No.	Order of Yield.	Record No.	Variety or Pedigree.	Yield per Acre.	Remarks.
				bush. lbs.	
2	20	..	Currawa	45 40	
4	21	..	Warden	45 40	
14	22	51	Grasby	45 20	
41	23	..	Federation	45 0	Exhibit from Royal Agricultural Show, 1919
7	24	..	Penny	44 40	
22	25	H1	Federation	44 20	
23	26	H2	Federation	44 20	
53	27	W4794D/22	Currawa × (Indian H × Federation)	44 20	
54	28	W4946E/1	Penny × Canberra ..	44 0	
25	29	L4056/4	Federation × American 8 ..	43 20	
51	30	W4791D/9	Currawa × (Indian H × Federation)	43 20	
29	31	W4322C/1	Hard Federation × Canberra	43 20	
12	32	..	Glencope	43 0	
37	33	Seln. 9	Golden Grain × Bobs ..	43 0	
45	34	..	Gallipoli (typical selected) ..	42 42	Sown 23rd June
9	35	..	Graham	42 20	
13	36	83	Grasby	42 20	
32	37	78A	Stanley × Bobs	42 20	
46A	38	W4015E/7	L4119-2 Ind. F × Federation / L4054-4 Ind. E × Telford's	42 15	Sown 23rd June
35	39	W4207E/2	Indian H × King's Early ..	41 40	
34	40	L4054/4	Indian E × Telford's ..	41 20	
8	41	..	Gallipoli	41 0	
54A	42	W4580D/3/1	Federation (Long's) × Federation	40 48	
31	43	4106	Stanley × Yandilla King ..	40 40	
1 20 40 55	44	..	Federation	39 10	Average of 4 check plots
15	45	..	Gluyas	38 0	
28	46	W4311C/1	Canberra × Hard Federation	37 40	Damaged by horses when opening up with stripper
17	47	..	College Eclipse	37 0	
16	48	..	Comeback	36 20	
52	49	W4792D/12	Currawa × (Indian H × Federation)	36 30	
11	50	..	Mac's White	36 0	
27	51	4101	Indian F × Federation ..	36 0	
36	52	Seln. 5	Golden Grain × Bobs ..	36 0	
18	53	..	Canberra	34 0	

Permanent Rotation Field.

The yields from this year's wheat plots in this yield are recorded in Table No. II. below:—

Table No. II.

Permanent Rotation Field.

Harvest Results from Wheat Plots, Season 1920.

Variety.—Yandilla King, graded, pickled with 1¼ per cent. solution of bluestone, and sown at the rate of 68 lbs. per acre.

Plot No.	Rotation.	Yield per Acre.	Remarks.
		bush. lbs.	
12	Wheat after peas, barley, and rape	19 32	Damaged by birds
16	Wheat after fallow, pasture, and oats ..	30 50	
18	Wheat after fallow and pasture	29 0	
21	Wheat after peas and rape	23 32	
24	Wheat after fallow	32 40	
26	Wheat continuously	4 17	
28	Wheat after peas and barley	16 7	
31	Wheat after peas and oats	19 55	
34	Wheat after rape and oats	17 2	Outside plot badly damaged by birds

It will be seen that the three best plots were those sown on fallow, and, of these, Plot No. 24 was top with 32 bushels 40 lbs. per acre. Prior to harvest, Plots Nos. 16 and 18 both looked better than Plot No. 24, although the former were rather unfortunate at seeding time, as bad weather caused such a poor germination that they had to be re-sown five weeks later. This probably accounts for the lower yields from plots in what are considered better rotations than that of Plot 24. Plot No. 16 is shown in Plate No. 3.

The lowest yield was, of course, that from Plot 26, where wheat is grown every year. This is the plot which was referred to in recent "Notes" in this *Journal* dealing with the prevalence of wild oats in plots continuously cropped.

Permanent Fertilizer Field.

The yields from the plots in this field are recorded in Table No. III., and, once again, the best results have been obtained from plots which received water-soluble phosphates in the form of superphosphate. The table is almost self-explanatory, but the following points may be emphasized:—

(1) Probably owing to the abundant moisture toward the end of the growing period, the super.-dressed plots have this year given

gradually ascending yields right up to the heaviest application of 2 cwt. per acre. Thus—

Plot No.	Treatment per Acre.	Yield per Acre.
		bush. lbs.
4A	No manure	13 0
5A	Superphosphate, ½ cwt.	24 24
10A	Superphosphate, 1 cwt.	24 44
6A	Superphosphate, 1½ cwt.	26 20
7A	Superphosphate, 2 cwt.	27 26

No. 3.—Samples from Rotation Field.
No. 24—Wheat after bare fallow. No 26.—Wheat continuously.

This handsome return from the use of superphosphate, combined with the residual value of the fertilizer for the use of pasture or succeeding crops, goes to prove that many farmers could profitably increase the amount of super. which they apply to their crops.

(2) A comparison of the yields from Plots Nos. 16A, 17A, and 18A, and also Nos. 2A and 3A, will show that the application of lime has reduced the yield this year.

(3) Although the plots which received farm-yard manure—2A and 3A—looked very well prior to harvest, the grain from these was "pinched" (possibly on account of rust), and the yield consequently low.

Table No. III.

Permanent Fertilizer Field.

Harvest Result, Season 1920. *Plot Area equals* ¼ *acre.*

Variety.—Yandilla King graded seed wheat, pickled with 1¼ per cent. solution of bluestone, and sown at the rate of 68 lbs. per acre.

Plot No.	Treatment per Acre.	Yield per Acre.
		bush. lbs.
1A	Superphosphate, 1 cwt.	25 8
2A	Farmyard manure, 10 tons	13 42
3A	Farmyard manure, 10 tons + lime, 10 cwt.	13 20
4A	No manure	13 0
5A	Superphosphate, ½ cwt.	24 24
6A	Superphosphate, 1½ cwt.	26 20
7A	Superphosphate, 2 cwt.	27 26
8A	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt.	27 4
9A	Superphosphate, 1 cwt. + nitrate of soda, ½ cwt., in spring	24 40
10A	Superphosphate, 1 cwt.	24 44
11A	Superphosphate, 1 cwt. + sulphate of potash, ½ cwt.	26 44
12A	Superphosphate, 1 cwt. + sulphate of potash, ½ cwt., and nitrate of soda, ½ cwt.	25 4
13A	Bone fertilizer, 1 cwt.	12 6
14A	Thomas' phosphate, 1 cwt.	19 40
15A	Superphosphate, ½ cwt. + Thomas' phosphate, ½ cwt.	25 48
16A	Superphosphate, 1 cwt. + lime, 5 cwt.	24 24
17A	Superphosphate, 1 cwt. + lime, 10 cwt.	23 32
18A	Superphosphate, 1 cwt. + lime, 20 cwt.	21 44
19A	Superphosphate, 1 cwt.	26 24
20	No manure (cropped continuously)	5 52
21	Superphosphate, 1 cwt. (cropped continuously)	14 0

Meteorological Observations at Werribee.

Summary of observations made during 1920, and comparison with averages for previous years :—

Rainfall.

Average annual rainfall for forty-two years prior to 1913 ..	=	20·19 inches.
Average annual rainfall for period 1913 to 1919 (7 years) ..	=	19·25 ,,
Rainfall during 1920 (13·54 inches fell during last five months)	=	21·69 ,,

Bright Sunlight.

Average annual total during 6-year period 1914 to 1919	= 1,807·7 hours	= Daily Mean, 4·9 hours.
Total during 1920 ..	= 2,138·0 ,,	= Daily Mean, 5·8 ,,

Evaporation.

Average annual total from free water surface during six-year period 1914 to 1919	= 47·026 inches.
Total during 1920	= 44·334 ,,

Mean Air Temperatures.

Period.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Mean of Max. and Min.
Average for 6 years, 1914 to 1919	58·1° F.	53·9° F.	67·3° F.	48·3° F.	57·8° F.
During 1920 ..	58·2° F.	53·5° F.	66·7° F.	48·2° F.	57·4° F.

Mean Soil Temperatures.

Period.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Av'ge for 6 years, 1914 to 1919	69·9° F.	51·8° F.	62·3° F.	54·1° F.	60·1° F.	55·6° F.	59·2° F.	57·0° F.
During 1920	67·2° F.	51·6° F.	60·1° F.	54·6° F.	59·7° F.	55·9° F.	59·0° F.	56·2° F.

Mean of Maximum and Minimum Soil Temperatures.

Period.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
Average for 6 years, 1914 to 1919	60·9° F.	58·2° F.	57·8° F.	58·1° F.
During 1920	59·4° F.	57·3° F.	57·8° F.	57·6° F.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder

or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Barley and oats are by far the cheapest food on the market at the present time. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation, but the quantities of both reduced to a minimum for sake of economy.

Sheep.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks for ewes with early-born lambs. Where possible, castrate the ram lambs immediately. Good prices will be available again this winter, particularly for lamb and young mutton.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

CULTIVATION.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

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